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The Cradle of Romanesque Architecture.

THE members of the Architectural Association who wisely intend to visit Northern Italy this autumn are to be envied their trip to "fruitful Lombardy, the pleasant garden of great Italy," where so many interesting and unique features will reward even the hasty inspection that can alone be given in the intended few days' stay in each of the historic towns which are to be visited. Turin, with its rectilinear streets, resembling so curiously the plan of an American city, and where that delight of Italy, the *portici*, the arcades which Napoleon after his Italian campaign endeavoured to introduce into Paris, as we see in the Rue Rivoli, is first met with,—Turin, with its famous Palazzo Madama and its famous Armeria, but with little else of interest; Milan, with its thousand treasures, too numerous to epitomise, but where the artist might revel many a happy month, studded with architectural marvels, dating from the deepest of the obscurity of the Dark Ages up to the present day, and which will doubtless make the Lombard capital the chief centre of the excursion; Bergamo, with its Broletto and choice Romanesque gem, Sta. Maria Maggiore; Brescia, with its antique Rotunda, and many another relic of the art of classic days, the Middle Ages and the Renaissance, not least among the latter the well-known Loggia; Cremona, with its few but rare specimens of the art of the past; Mantua, reflected in its calm lake, and alive with recollections of Virgil, and with many another famous feature, too sacred to be merely hastily mentioned; Pavia, where San Michele is a mine of artistic study, and in its neighbourhood the world-famed Certosa, thickly set with jewels of Renaissance art,—all these are to be visited, and many another quiet spot where lingers still, spared by the respecting hand of time and the more ruthless march of human progress, traces of the art of the days when all was so different, when the very years seem to have been longer, and the life such as we can scarcely picture with exactness to our mind's eye. Italy in this respect possesses a peculiar charm for the artist, teeming as it does with recollections, and begemmed with marvels of architecture, sculpture, and painting, where so much speaks of the by-gone days, where the traditions of the distant past may still be found alive, and, above all, where cities differ from each other, separated but by a few miles of ill-kept road,—a classic soil, on which the formation of modern Europe has left at each step its plainly-read mark, where the mind and eye are charmed with pleasures of ever-renewed novelty.

The district to which the Architectural Association more particularly devote their attention is one of the most interesting in Italy. The Lombard plain, studded with its innumerable cities, fabulously wealthy in the past, and even now forming the richest portion of the peninsula, presents to the artist generally, be he architect, sculptor, or painter, a series of features that possess an exceptional interest. For the architect more specially there are points for study and research of the deepest professional value. The nature of the country; its situation; the history of the development of its culture, and consequently of its artistic progress; the elements that influenced this development, and the results that attended it, offer a series of inquiries of something more than an archæological value. Of this fact we shall be convinced when the results of the excursion will have been made known; for Lombardy is the cradle of that strange and beautiful style of architecture which has been termed the Romanesque, one of the most important of the many steps in the slow development of modern from Classic architecture, the expression of the change of a belief from Paganism to Christianity with its new needs, its new aspirations, and its new hopes.

This Lombard origin of a special style has led to the adoption of the term "Lombard," as applied to the architecture (belonging to a certain period) of this portion of Italy, but the accuracy of the term may be questioned. The barbarians who, in the sixth century, invaded Northern Italy, under the dreaded Alboin, brought with them to the South no architectural traditions of their own; but, once arrived in the fertile plain of Lombardy, we can trace how the style of architecture that arose after this important event was created.

Throughout the whole extent of her widely-spread empire, Rome had left the traces of her monumental art; and after the centuries of neglect and ruin that followed the fall of the Roman rule, these same buildings formed the sole models of construction and of decoration when not themselves directly used or their materials. This influence is everywhere traceable, but in varying degrees; in the western portion of the empire the deep-rooted traditions of the past were too powerful to be much affected, as we see them later on, when the capital is fixed at Byzantium, branching out in a purely original direction, when the Greek empire was in its turn to influence the world, not alone westwards, but again eastwards, and the recent archæological discoveries in Central Asia have shown us how far this influence extended. While in the East the new Greek art was rapidly reaching its zenith, in the West the deserted Roman art was slowly dying,—not, however, before it had exercised its spell on the comparatively uncultivated people to whom it formed the sole school of tradition.

Under these influences, Roman art daily grew more corrupt, and its precepts and rules were forgotten; slow, indeed, was the decay,—slow as was the disappearance of the purely foreign element among the Italian populations. With this fact once accomplished, and order again established, the necessity for self-defence ceases to become the all-absorbing thought. With the attendant leisure is developed the desire for refinement and for art. Generations are yet to pass before this desire finds its full expression, but the seeds have been laid, and in time we see them blossom forth into a distinct and original art, known as the Romanesque or Romano-Byzantine, which it has been urged, but erroneously, first had its origin in France. Northern Italy is the cradle of this interesting and beautiful style of architecture, and there still exist a number of rare and perfect specimens of the creations of its artists.

As the modern school of scientific research has shown us is the case with the action of nature, so in art, no perceptible change is the result of accident, but is due to the effect of surrounding influences. What these influences were in Lombardy it is not difficult to study. As early as the sixth century, we find the traditions of Roman architecture affected by Byzantine art; the former had long been settled in the country, and existed, as an art of the past, in the numerous Classic remains, and, as a living art, in the Christian basilicas which since the time of Constantine the new religion had industriously erected. The second, the Byzantine art, we see introduced during the rule of the Goths, not manifesting itself solely on the shores of the Adriatic, as we see it in San Vitale at Ravenna, but penetrating to the very heart of Lombardy, where in Milan itself, in addition to several basilicas of the fourth and fifth centuries, we see rise a superb and thoroughly Byzantine church, dedicated to San Lorenzo.*

What this admirable Byzantine architecture was, and its origin, it is unnecessary here to inquire; suffice it to say, that with the transfer of the seat of the Roman Empire to the banks of the Bosphorus, this new and characteristic style makes its existence known. From its timid commencement in the second century, at Baalbec and Palmyra, it had gained in strength and boldness, till the day when Isodorus, of Miletus, in building the Temple of St. Sophia, consecrated the new style which succeeded that of Rome. Again the genius of the old Greek artists seemed to have risen from its long slumber, and if the new expression may not possess the Classic purity of its elder sister, its marvels were to astonish, as they still

* See Dartein, "Étude sur l'Architecture Lombarde, et sur les Origines de l'Architecture Romano-Byzantine," Paris, 1870, folio, with an atlas of plates; and Vitet's "Etudes sur l'Histoire de l'Art," série deux,—Moyen Age; to which admirable works, with the cross references to be found in their pages, we are much indebted. Dartein's work, after an introduction, treats in detail a number of existing churches of the Romano-Byzantine style; Sant' Ambrogio at Milan; San Celso, also at Milan; at Brescia, the basilica of San Salvatore; the little church of Sta. Maria in Valle, and San Pietro di Civate; Madonna del Castello, near Almenno; and the Rotonda at Brescia.

do, the artistic world. "For the second time the Greeks held the sceptre of the great and noble builder's art; it was from them that the Arabs received its secrets, it was by them that the first lessons reached Europe, when in the eleventh century, after 500 or 600 years of darkness, the West again sought the light, and sought it in the East."*

In the West, however, the Roman traditions still formed the sole architectural school, so rooted that when Diocletian brought back, in the third century, from his Asiatic wars, an admiration for the Eastern architecture, which showed itself in his palace at Spalatro,—a coarse imitation of the Temple of Baalbec,—the innovation was to remain unnoticed. As Vitet has well expressed it, every spark of imagination had died out in this Italy, exhausted by eight centuries of grandeur. Even when from time to time rose in the populous centres some building, the architect of which had drawn his inspiration from travel in the East, its influence was *nil*, and the mass of constructions continued the Roman traditions, each day growing heavier and coarser. The relations between the two empires became rarer every day; the distance increased by the schism in their religious belief; thus the architectural movements of the East and West long remained mutually unaffected.

A point which Vitet has shown clearly as still further aiding in the maintenance in the West of Roman traditions, arose from the differing types of the places of worship adopted by the two empires; while the West modified for their religious purposes the basilicas of pagan Rome,—a tradition long retained, as we see in the basilica of San Clemente at Rome, Santa Praxeda, and St. Martin, built in the ninth century,—the Christians of the East created a new type, and built churches. What the basilica was it is needless here, in detail, to describe; suffice it to say that in the Roman city it served as the court of law, the hall of justice. The basilica was used by the Christians in preference to the temple, greatly on the score of its superior size. The temple, soiled as it was by Pagan recollections, and closed to the use of the new religion, there remained the two courses of adopting the basilica, or creating a new type of place of worship; the less noble, less religious course was adopted by the unimaginative Westerns, and the basilica was chosen, the idea further finding favour with the bishops, who sanctioned in the old temple of justice the worship of the new faith. The change was an easy one to make, and soon the painter and the mosaic-worker had decked with their suggestive symbolic images the walls and "tribune," as the apsis was called before that Greek term prevailed. A few further modifications were necessary,—into which, however, at this point, it is unnecessary to enter, — with the addition of the exterior "atrium," with its colonnade (such as still exists in Santa Ambrogio, in Milan) to shelter during the celebration of the mysteries the as yet uninitiated catechumens,—and in the midst of which rose the simple octagonal baptistery, with its sacred vase of symbolic purification, pointing out, by its position at the door of the temple, the road by which it alone might be entered. The further addition made of the beautiful and religious conception of the subterranean "confession," where reposed the relics of the martyrs, and the pagan basilica was transformed into a Christian place of worship, to affect for many a generation yet the monkish builders. Thus we see the Roman style prevailed, and was perpetuated by this adoption of the basilica for the usages of the new worship.

It was at this position that architecture had arrived when the barbarous Goths descended into Italy, swept over the fertile plain of Lombardy and down the pleasant coast of the Adriatic, driving before them the population. It was at this time that Venice was formed on the mud flats at the mouth of the Piave and the Brenta. But the Goths, as so often happens with conquering nations, were to be in turn overcome by the refinement of their enemies, and the prevailing Roman taste was to influence their untaught artistic natures. We have only to mention the tomb of the learned and enlightened Theodoric at Ravenna,—at this moment so seriously threatened in its existence,—and we see how Roman is its style; and yet Theodoric had been educated in Byzantium. In building his tomb he was, however, obliged to employ Italian workmen.

* Vitet, "Etudes sur l'Histoire de l'Art,—Moyen Age." Paris, Edition 1866, 8vo., p. 296.

Let us not pass over the mention of this wise and good prince,—an early archæologist of the truest type,—without a tribute of respect to his memory. His influence was to be marked on the later artistic and literary development of Italy, and his reverence for the past led him to a holy respect for its noble architectural creations. He it was, let us not forget, who wrote to his architects, Daniel and Symmacus,—"You will repair those monuments which have suffered by the effects of war, but in such a manner that they shall not appear to have been repaired, and,"—a sentiment, be it remarked, uttered now 1,300 years ago,—"that the original construction shall alone be re-established in its primitive state."

But the rule of the Goths was to be overturned, and under the renowned and unfortunate Belisarius and Narses, Italy was again to become one of the jewels in the crown of the Roman Emperor reigning at Constantinople. Had the Greeks only kept their hold on the empire, it is more than probable that from their appearance,—that is, in the sixth century,—the traditions of Byzantium would have taken root in Italy; for it must be remembered that to this period belong the baptisteries of S. Giovanni, built by the Archbishop Neo, and the beautiful Church of San Vitale at Ravenna, both in the purest Byzantine style; but still the introduction was distasteful, and we see at a later date the Bishop Ursicinus build his grandiose Church of St. Apollinaris according to thoroughly Roman principles and traditions. The Greek influence had, therefore, not yet commenced to work when the allies whom they had imprudently called in, the Lombards, or Longobards, seized Italy.

It has been, as we have above remarked, a subject of no small discussion whether the architecture termed "Lombard" was not an introduction of these barbarous conquerors. But in the present day the question has been satisfactorily settled. The Lombards, a wilder and even less civilised people than the Goths, can scarcely have introduced an architectural style of their own. Indeed, so improbable do facts show this Lombard origin to be, that it may be dismissed without further discussion.

The Lombards, once settled down, did as their predecessors had done, and conformed themselves to the tastes and traditions they found about them. At this moment there existed in the world,—the world as it then was understood,—but two styles, which Vitet, and others before him, have concisely termed the Neo-Greek and the Bastard-Roman. The Lombards, therefore, when their refinement led them to that necessary consequence of all cultivation, the consideration of the arts, had alone to choose between these two styles, and a very indifferent acquaintance with the early architecture of Northern Italy will show that all those works attributed to the Lombards are either semi-Roman or Oriental. But it is to be remarked that it is to the former that they attached themselves, and for this fact it is easy to account. Western by birth, the Lombards remained strangers and unfriendly to the Greeks and their ways, and such, during their stay of two centuries, they continued to be. Their tastes were purely Roman; they spoke and dressed in the Roman fashion; it is therefore scarcely likely that they would have employed Greek architects; the utmost they had seen of San Vitale at Ravenna was its shining cupola on the horizon, while at home they lived in the midst of ruins and of buildings stamped deep with Roman traditions.

Such was still the Roman influence, that when the Lombards leave Italy, we trace it in the eighth and ninth centuries. San Clemente, as has been above remarked, built in this latter century, is in its general character a pure basilica. But times were about to change. The influence of Byzantium commences to filter into the West. The German Emperor Charlemagne, Roman in his refinement, leaves, in his palace at Ingelheim and on the banks of the Rhine and the Garonne, the traces of his admiration of Oriental architecture. Vaguely he foresaw that it was thence that was to spring,—many centuries were to elapse before his prophecy came true,—the daybreak of refinement and culture, and after seeing San Vitale at Ravenna, Aix-la-Chapelle is gifted with its wondrous temple; but for Northern Europe, with the death of Charlemagne, the light was to die out again; deeper shades still were to fall on the Dark Ages, and which alone can explain the superstitious belief which prevailed that with the fatal year 1,000 the world was to close its career; at such a moment architecture was to suffer the most seriously of the arts, and the tenth century is the saddest, the most miserable in its history, as indeed it is in that of European civilisation.

When at length opened the new century, a fresh spirit is infused into the West, particularly remarkable in Italy, under the enlightened rule of Otho the Great. The high roads of commerce were frequented again, the ports re-opened, the trade between the East and Italy flowed again West, and the rich tissues, the perfumes, the secrets of the arts and learning of the Orient became known to the West. With the increase of wealth and ease came naturally refined tastes; and the grandeur, commercial and artistic, of the Italian cities, rivalling each other in splendour, commences from this date.

Italy and the West thus prepared, Byzantine architecture again makes its appearance, not, as in the sixth century, in the midst of war and calamity,—not as in the reign of Charlemagne,—but among a wealthy community seeking for a new expression of the new needs of a new society. Penetrating by the Adriatic sea on the east, by the Arno on the west, the Venetians on one side in their basilica of St. Mark, on the other the Pisans in their superb cathedral, were the first to accept the traditions of Byzantium. Venice and Pisa are followed by Verona, Ancona, Lucca, Ferrara, Bergamo, Parma, Milan, all the great towns of Northern Italy. Soon, writes Vitet, the Italian soil was covered with monuments more or less Oriental, at first simple and severe in their magnificence, then elegant and light, and later on more ornate, more florid each day. The new style reigned unrivalled for two centuries, till Europe, through one of those circumstances which make the history of art so noble a drama, turned with enthusiasm in the thirteenth century to another architecture which Italy alone received with coolness, the ogive architecture, which created the cathedral of Rheims, the cathedral of Cologne, the spire of Friburg, in Brisgau.*

The Oriental tradition mingling with the still existing traditions of the Roman builders, created that architectural style known as the Romano-Byzantine, or the Romanesque, which found in Lombardy the favoured land of the meeting and blending of the two influences of which it was made up. From Lombardy the monkish architects bore the new style to France, to Burgundy, and to chillier Normandy, whence in time it spread throughout France. The Norman Conquest was to introduce it into our island, where the creations of its artists, familiar to the profession, are to be found in many a quiet old-world corner of England. Germany was to receive even more directly the architectural influence of Lombardy, which showed itself markedly on the banks of the Rhine.

With the eleventh century the Church, now growing rich, was to develop its architectural zeal with an energy which, particularly noticeable in Italy, was to spread throughout Christendom, and the Romano-Byzantine style was to cover Western Europe with its characteristic productions, modified in each country by those local influences which are so invariably to be noticed in the history of architecture, and which have properly led to almost similar works belonging to the same family being denominated differently in different countries, and even provinces. In this sense of the term, "Lombard architecture" must be regarded as the purely local expression of the Romano-Byzantine style in Northern Italy. Once this fact is understood, there cannot again arise the possibility of a belief that the invading Lombards, or Longobards, introduced into Italy an original architecture. This fact is the more important to have settled, as it is in the monuments of Lombardy and Northern Italy that the Romanesque style is to be studied in its most distinctive and original character, and where it has left so many still-existing creations of its architects, all stamped with a peculiar character of striking beauty, the direct result of the honest faith in which designer and workmen toiled so steadily together. This character it is out of place to describe; it is familiar to every student of the history of art. Northern Italy is the cradle of this style, and the Architectural Association, in their present trip in Lombardy, will have many opportunities of studying on the spot the earliest creations of this intensely-interesting period of the development of their art, which was to lead to the later marvels of the Gothic architects.

* Vitet, p. 310.

There exist throughout Northern Italy a large number, comparatively speaking, of monuments belonging to this distant period, and to these more than one member of the Association will pay especial attention; the conceptions of these early architects are worth minute observation, particularly by the English student, the constructive materials used by the Lombards being precisely the same as those necessitated by the geological structure of England. The same material necessities that influenced the architects of those times regulate the conceptions of the English architect of to-day. The want of building stone, or rather the extreme difficulty of obtaining it, in Constantinople,—which, when it became the capital of the Roman Empire, saw rise in every direction gorgeous palaces and churches,—and the abundance of clay, obliged the Byzantine architects to employ brick as their building material, and in this course they had the precedent of their ancestors at Nineveh. In Northern Italy this feature of the early architectural style is peculiarly noticeable, and, let it be remarked, the noble edifices which the Lombard architects erected with the aid of honest bricks and mortar, destroy for ever the theory so often put forward that with small building materials it is impossible to create great works.

The Architectural Association will make one of their chief objects of study, during their excursion, the use of brick and terra cotta, so largely employed throughout Lombardy, and valuable results may follow their combined inquiries. How long the traditions of the use of brick and more elaborated terra cotta were retained, and what results may be obtained by their aid, we see in the graceful creations of that great architect of the Renaissance, Bramante, in his church of Sta. Maria delle Grazie, in Milan, which the Association will do well to study, as it is shortly to be handed over to restorers. In the hands, however, of such learned students as Sig. Angelo Colla, and his accomplished co-worker, Sig. Tullo Messarani, the necessary work may, we trust, be as lovingly done as could be desired.*

What other wonders the Association on their tour will see, those who know Northern Italy will remember,—wonders ranging from the Classic architectural remains scattered over Lombardy, no less plentifully than elsewhere where the Roman power was dominant, through the Dark Ages and the Revival down to modern days. It is to be hoped they will not neglect the architectural works of the Renaissance, as brilliantly represented in Northern Italy as are the still earlier and rarer remains of the Romanesque period.

MARGINS OF SAFETY.

WE recently drew the attention of our readers in the pages of the *Builder* to the unsettled state of the question of wind-pressures as affecting exposed surfaces over widely-extended areas. The absolute necessity of having some reliable data to go upon in the case of structures that are subjected to exceptional dangers from atmospheric disturbances will, no doubt, urge itself upon the scientific world, and it is to be hoped that ere long no doubtful answer will be given to the questions that are being at present asked on the part of practical engineers and the public generally, as to the necessary margins of strength that will secure absolute immunity from accidents. In the meantime, no harm will be done by looking back upon the sayings and doings of the early masters of those arts which, within recent years, have been subjecting the forces of Nature to the uses of man, and one passage occurs to us as peculiarly appropriate at the present time, not only as regards wind-pressure, but in its general bearing on the question of stability. "When we have to do with, and to endeavour to control, those powers of Nature that are subject to no calculation, I trust it will be deemed prudent not to omit in such a case anything that without difficulty can be applied, and that would be likely to add to the security." These words are Smeaton's, and are quoted by one of the most eminent engineers of our own time, as of exceptional authority as coming from the mouth of "our greatest marine engineer."

Taking the sentence we have just quoted as a text upon which to hang a few observations, it will be noticed first that there is an admission on the part of Smeaton which implies that he was himself in the habit of dealing with natural forces that were subject to no calculation. These were for the most part either wind, or the destructive agency of heavy masses of water driven violently against artificial obstructions by its fury. If an engineer is to be justified in throwing over the time-honoured maxims of his profession by distributing his materials in a manner that differs essentially from previous practice, he must be able to show that all the possible forces with which his finished structure has to contend have been exactly calculated, and a sufficient margin of safety provided for each and all of them. Where the force is of such a constant character and is subject to such a well-known law as that of gravity, Smeaton's words imply an exception. There is no reason why the calculated strains to be provided against on account of the mere weight of a structure, and of a passing load, should not be estimated with the utmost exactness; and in these cases the margin of safety may be provided for more as a safeguard against possible flaws of material than as a provision against any ignorance of the forces that are subject to established laws. Smeaton, were he still living, would no doubt have been as much opposed to unnecessary accumulations of material as the most advanced of our modern engineers. All this, however, leaves the question of uncalculated forces practically untouched, and when provision has to be made for withstanding the fury of the winds and waves, the words we have used as a text have lost none of their significance.

When writing on the subject of wind-pressure, we pointed out that there is no established rule for the guidance of engineers and architects in the case of structures that offer an exceptionally large area to the force of the winds in exposed positions. Nearly a century has passed since the days of Smeaton, and, considering the immense strides that have been made in the theory as well as the practice of engineering during the years that have intervened, it is somewhat astonishing that such a state of matters should exist. We concluded with the expression of a hope that the magnitude of the interests involved in the construction of such vast structures as those which are required for bridging the estuaries of the Tay and the Forth may soon have the effect of bringing about a full scientific investigation of the subject, and a clearing up of all doubts for the future.

Meanwhile, when we consider that the admission made by Smeaton with regard to the existence of "powers of nature that are subject to no calculation" still holds good, it would be well for engineers engaged in works of such a character to pin their faith to the second part of the sentence, and "not to omit in such cases anything that without difficulty can be applied, and that would be likely to add to the security."

The particular circumstance that gave rise to these words was the proposal made by Smeaton to use joggles in the masonry of the Eddystone Lighthouse, and it is not at all unlikely that they were used as an argument for the expenditure of more money than those who were responsible for its erection were willing to spend. It would be well if engineers, instead of making efforts to save money at the expense of stability, as too frequently happens, were rather ready to find arguments such as Smeaton's for convincing their clients that the most costly structure would more than likely prove to be the cheapest in the long run. Although the effect of nearly a century of storms has made it necessary to reconstruct the Eddystone, and to reconsider its design, the precautions of Smeaton were so far justified that he was able to state that "after a stone was thus fixed we never, in fact, had an instance of its having been stirred by any action of the sea whatever." Had the circumstances varied and the structure been exposed to still greater violence, Smeaton would, no doubt, have seen his way to making still further provision for the safety of the structure consistently with the principle laid down in the sentence referred to. Until, then, engineers and architects are in a position to estimate the maximum possible force of the winds and waves in a given situation with as great certainty as the force of gravity,—and it is exceedingly unlikely that any such perfection of information will ever be attained,—until, in fact, the "powers of nature that are subject to no calculation" are thoroughly understood, it will be well for them to provide margins of safety that are far more than sufficient to withstand any average, or even any observed, destructive force. Works that have been designed to withstand the fury of the elements frequently succeed in doing so until their sufficiency becomes a standard for similar undertakings, and it happens not unfrequently that after they have served the purpose of a precedent their destruction proves the fallacy of the argument. In the construction of masonry to act as a breakwater in exposed situations it would, indeed, be difficult to over-estimate the allowance that ought to be made for exceptional exhibitions of natural forces.

A quotation from the report by the Messrs. Stevenson, upon the effects of a storm which took place at Wick, in 1872, is an apt illustration of how wide the margins of safety, in certain cases, ought to be. "The (seaward) end of the work, as has been explained, was protected by a mass of cement rubble work. It was composed of three courses of large blocks of 80 to 100 tons, which were deposited as a foundation in a trench made in the rubble. Above this foundation there were three courses of large stones carefully set in cement, and the whole was surmounted by a large monolith of cement rubble, measuring about 26 ft. by 45 ft. by 11 ft. in thickness, weighing upwards of 800 tons. This block was built *in situ*. As a further precaution, iron rods 3¼ in. diameter, were forced in the uppermost of the foundation-courses of cement rubble. These rods were carried through the courses of stone-work by holes cut in the stone, and were finally embedded in the monolithic mass which formed the upper portion of pier." . . . . . "Incredible as it may seem, this huge mass succumbed to the force of the waves, and Mr. Macdonald, the resident engineer, actually saw it from the adjacent cliff being gradually 'slewed' round by successive strokes until it was finally removed and deposited inside of the pier. It was not for some days after that any examination could be made of this singular phenomenon, but the result of the examination only gave rise to increased amazement at the feat which the waves had achieved. It was found on examination by diving that the 800 ton monolith forming the upper portion of the pier which the resident engineer had seen in the act of being washed away, had carried with it the whole of the lower courses which were attached to it by the iron bolts, and that this enormous mass, weighing not less than 1,350 tons, had been removed *en masse*, and was resting *entire* on the rubble at the side of the pier, having sustained no damage but a slight fracture at the edges." It is quite impossible that an estuary can ever be the scene of such destructive agencies as those which occur on portions of the coast exposed to the full force of the open sea, but such extraordinary phenomena with regard to the waves ought to be well considered even in the case of a comparatively-sheltered structure, when the lives of passengers, as well as the capital employed, are involved in its failure to withstand their fury.

THE ABATEMENT OF NUISANCES.

ALTHOUGH it is a maxim of the law that there can be no wrong without a remedy, it is not unusually in the nature of the law to make that remedy which it gives to a sufferer a long and tedious one. Wrongs to property, especially, are often the most difficult and expensive to obtain redress for, and a legal remedy is therefore often regarded as only one degree better than the wrong itself. But there are certain matters in respect of which the law permits a man to seek redress by his own hand, and with the utmost expedition that he pleases. This is a privilege of the highest value to owners of property; but, just as Pope stated that a little learning was a dangerous thing, so we, perhaps, may be permitted to point out that the power of private redress is also somewhat of an edged weapon, and may not improbably wound him who employs it. Perhaps, too, no persons have more interest in such private remedies than have owners of buildings and land, and it is for this reason that we propose to offer a few remarks on the question of the abatement of nuisances to show what is the power which the law gives to private persons, and consequently within what limits it is confined. A well-known legal writer has gone so far, indeed, as to state

* As to those who will more especially devote their attention to Sta. Maria delle Grazie,—with which Bramante's name is linked indissolubly with that of Leonardo da Vinci,—may we venture to refer them, while at Milan, to Sig. Colla, whose drawings of projected restoration of the church formed so conspicuous a feature in this year's architectural exhibits at the Paris *Salon*, as was noticed in these pages? To the restoration of another of the Renaissance buildings of the Lombard capital, Sig. Colla has also devoted his attention, the Palazzo Marino, now the Town-hall of Milan.

that it is never advisable for a person to pursue this remedy; but we think that if employed with care and caution, and with a clear knowledge of the object sought to be attained, it need not prove so exceedingly dangerous. As regards nuisances themselves, it must be borne in mind that the legal meaning of this word is somewhat different from that which it holds in common parlance. It is used in its broadest meaning, and does not mean something offensive to the senses, which is the usual meaning attached to this word. Derived as it is from the French *nuire*, to hurt, it means something which injures and hurts property or person, and has thus a very extended range. It has also been defined as being a consequence of something not directly or immediately injurious, — injurious, however, in its effect. Thus a person who digs a channel or erects a dam on his own land does no more than what is in itself lawful; but if the effect of his so doing is to divert the water from a natural water-course, to the loss of a riparian owner below, or to turn it back to the injury of a riparian owner above, such acts become unlawful. The first point, then, in regard to this subject, which is very elementary in its nature, is that a thing must first of all be a nuisance before it can be abated. It is not enough that there must be fears or probabilities of a certain thing turning out to be injurious; it must actually have developed into this legal species before a person can take the law into his own hands. On the other hand, it is satisfactory for an injured party to know that if the nuisance is so mixed up with some legal right as to be inseparable from it, then, that this legal right may be put an end to by the abatement of the nuisance. The case of Cawkwell *v.* Russell (26 *Law Journal* Reports, Exchequer, p. 34), decided in the year 1856, and which has always been regarded as sound law, is an instance of this proposition. The result of the case could not possibly be put in briefer form than it is in the judgment of Baron Alderson, which is perhaps the most pithy judicial decision to be found in the law-books. We give the whole judgment in the following lines:—"If a man has a right to send clean water through my drain, and chooses to send dirty water, every particle of the water ought to be stopped, because it is all dirty." There the plaintiff had been suing the defendant for obstructing the drainage of his houses, and it appeared that the plaintiff had a right to let clean water run through the defendant's drains, but as he sent dirty water the defendant took the remedy into his own hands, and so completely abated the nuisance that he also stopped the flow of clean water. Hence arose the judgment which we have set out above, and which forms a capital illustration of the proposition, that if a nuisance cannot be abated without the conclusion also of some legal right, that legal right must cease. But it must also be borne in mind that it will not do in all cases to act in this wholesale kind of fashion, and that if the nuisance is abated in an unreasonable manner, the person so doing lays himself open to the unpleasant consequences of an action at law, and illustrates what we have already said that the abatement of nuisances is somewhat of a two-edged legal weapon, which may cut and injure the user of it. Let us give an example also connected, as was the last instance, with the flow of water. A plaintiff had a prescriptive right to the flow of water led by means of a gutter from a mill-stream at a point where an ancient weir was erected, and he wrongfully lengthened the gutter for the purpose of irrigating more land. Consequently the flow of water down the defendant's mill-stream was diminished, so that there then existed an injury or nuisance which he might abate. But, unfortunately, he set about doing so in too thorough a manner, for he pulled down the ancient weir, and consequently prevented any water at all from flowing on to the plaintiff's land. Such in brief were the facts in the case of Hill *v.* Cook (26 *Law Times*, new series, p. 185). The result of the action which the plaintiff naturally brought against the defendant was that the Court held that the defendant was not justified in stopping the plaintiff's excessive user of the water by means which altogether prevented his enjoyment of the water. Again we may quote from the judgment, namely, that of Mr. Justice Willes, whose decisions always command the highest respect. "The flow of water," he says, "to the defendant's mill was injured by the alteration of the gutter, and the plaintiff had thereby destroyed the measure of his right over the old course, and created a confusion of his ancient rights. If the whole of the defendant's right had been interfered with, as it was in the case of Cawkwell *v.* Russell, then the taking down of the weir would have been a reasonable mode of destroying the plaintiff's enjoyment. However, he is bound to abate the nuisance in the most reasonable manner, and subject to there being no confusion of rights created, the jury have found that it was not practically necessary for the purpose of abating the nuisance to pull down the weir. If the extent of the nuisance was so great that it was reasonably impossible to abate the nuisance, then I should say there exists a right on the part of the proprietor of the servient tenement to interfere with the whole." It would not be easy to state the law upon this subject much more clearly than is done in the two judgments which we have quoted, as they show what is the power which the law places in the hands of a person who is affected by a nuisance, and within what limits that power may be exercised. But it will also be noticed that in the last judgment Mr. Justice Willes speaks of the jury,—the great judges of fact. Hence it will be obvious that dangers arise in the abatement of nuisances by private individuals because what may appear reasonable to an aggrieved and injured individual who does not look at the matter in the calmest possible light, may appear by no means so reasonable to a jury of his countrymen, feeling at the moment great belief in the sanctity of the law of which, in that particular case, they are the temporary guardians. No doubt the owner of the mill-stream did not consider that he was doing an unreasonable thing in stopping *in toto* the flow of water, but when it came before the jury and the bench, a different opinion prevailed. Hence we have here an instance also of the necessity for not acting without careful consideration, and only going to the extent of stopping the actual nuisance. Again, to touch most briefly on another point: as a rule, no previous demand to remove the nuisance is, except in some exceptional cases, necessary. Still, we would never recommend a man to abate a nuisance without first demanding its removal; for should the matter come before a court of law, the absence of such a demand does not place the "abater," as we may call him, in a favourable light. Owners of land and buildings, if they have these main principles in their mind which we have pointed out, and if they act calmly, may thus find the abatement of nuisances by their own hand a more speedy and more satisfactory remedy than an appeal to the courts of law.

MODERN NEW YORK.

THE halo of tradition that surrounds the name of New York is by no means exceptionally attractive or important. New York is essentially a modern city, and visitors from the old world come and glance at it, not for the purpose of seeing architectural remains of bygone generations; not to gaze on archives, or monuments centuries old, but to see a modern city,—a metropolis throbbing with business life, one of the world's busiest marts, standing at the back of one of the finest harbours in the world. It is not too much to say that the foreign visitor cannot possibly see anything around the wharfs at which he may land to favourably impress him. We have no docks, really, unless the somewhat dilapidated wooden piers at which the ships land their passengers and goods can be dignified with the name. When the visitor to our city for the first time has run the gauntlet of the Custom-house officers, and protested against the extortion of the cab-driver, he gazes with astonishment on the wretchedly dirty appearance that almost everything wears. The streets, even in the heart of the city, are filthy and uneven. The best of them are paved with granite blocks, more or less irregularly laid, which renders riding in an ordinary vehicle, or walking, very tiresome. Gaunt top-heavy telegraph-posts stud the causeways thickly along the most important streets, for, with all their improvements, New Yorkers have never yet put any of their telegraph-wires underground.

When a man has fairly settled himself down to view men and things from an unprejudiced standpoint in this marvellous city, he cannot but find much to delight him. To walk from the extreme south end of the island along the Broadway in a northerly direction for six miles, and realise that the whole island was sold so recently as 1626 to the Dutch Governor by the Indians for $24,—that in 1656 it contained only 120 houses and 1,000 inhabitants,—is no easy task. The development of the city has been unique in the history of cities. It is true enough,—and no one can distinguish the fact more easily than an Englishman,—that there is a great deal of room for improvement. One of the greatest and ever-present grievances is the bad condition of all the streets. The pedestrian who walks along Cheapside, London, is inconvenienced but little by the noise of passing vehicles, owing to the smoothness of the material with which the street is laid. But in the Broadway,—and, in fact, everywhere in New York, where there is any great amount of traffic,—the incessant noise, clatter, and rumble are well-nigh distracting to all quiet mortals who regard a continual deafening sound as one of the banes of mundane existence. Even in Fifth-avenue, the great aristocratic street of the city, along which stand the residences of some of the richest men in the country, there is no asphalte or wood-paving,—nothing but hard, badly-laid granite blocks. In all my perambulations, I have not seen a square yard of wood-paving anywhere. Why it finds no favour I can form no idea, especially when considering the vast amount of wood which the country produces.

To see modern New York at a glance, one must needs take a walk along Broadway, called by the old Dutch settlers "Heere Straat." This is the city's great spinal column, and it is the one great thoroughfare running north and south that declines to observe the arrow-like straightness which is the characteristic of most of the streets. It swerves now to the west, and then to the east, cutting across several "avenues," which, being laid out more recently than the erratic "Heere Straat," continue their course in as straight a line as men could draw. The individual who walks up this grand thoroughfare for the first time without uttering the word "magnificent" many times must be sadly deficient in his power to appreciate architectural boldness and skill. On either hand, for five miles, there is an embarrassment in the riches of gigantic solid stone, brick or iron structures, used as hotels or for business purposes. While it is not my intention to refer in detail to the noteworthy buildings of New York, I would not pass without a word concerning the oldest house in the city. It is now known as "Washington Hotel," and is No. 1, Broadway. It was erected in 1742 by Sir Peter Warren, K.C.B.—a name immortal in the annals of English maritime warfare. At the time of its erection it was the most magnificent building in the city, but it has long been eclipsed now. While 138 years is but a small period in the history of some houses in the old world, we regard Washington Hotel as a very ancient building, because it is the most ancient we have. There is an interest attached to it, moreover, in the fact that Sir William Howe, Sir Henry Clinton, and Sir Guy Carlton (afterwards Lord Dorchester) all patronised this house. Improvements are constantly being made along Broadway. Small and unsightly houses, erected before the present generation entered into active life, are gradually disappearing, and in their places buildings, fitted up with the latest improvements and appliances, are being reared to the height of seven, eight, or ten stories.

The elevated railroads, of which the English bear only fragmentary accounts, are a great boon to those who live several miles from the heart of the city, though they are a great nuisance to those past whose houses they run. They are badly managed at present, but with good and fair treatment the public would admit that they were an inestimable boon. An extension northwards, which without these railroads would render travelling from one end of the city to the other a long task, is rapidly progressing, and many fine new buildings are now being erected on ground which a few years ago was considered far into the country.

T.

New York.

Penrith.—Messrs. Graham's premises, in the Market-square, are being rebuilt. The front is of local red stone, the roof being broken with half-timber gables. The new building, designed in the old English style, will present a picturesque appearance. The work is being done by Mr. Grisenthwaite, of Penrith, from the designs and under the superintendence of Messrs. Hetherington & Oliver, architects, of Carlisle.

HOUSE DRAINAGE AND SEWAGE WORK AS A SPECIALTY.

THE tenour of the evidence which has been received by the Sanitary Section of the Society of Arts, and discussed at meetings of the society, has shown that the most fatal errors in the application of settled principles of sanitary work are committed in the construction and drainage of edifices even of the first-class in the metropolis, by architects of the highest position. I believe I am warranted in stating it as the conviction of the section, that for the public protection, the subject of house-drainage must be cultivated and practised as a specialty. This conviction will, I believe, be strengthened by what takes place in the United States. There, the English practice in house-drainage works and sewerage is generally closely followed by American as well as by English architects and artisans. There may be deviations from old routine, and improvements might be looked for from American artisans, where the conditions are such as to stimulate the exercise of the suggestive faculty of ingenuity; but there, as here, they do not appear yet to arise in common practice. A report made to the Massachussetts State Board of Health, by Mr. Elliot G. Clarke, principal assistant engineer of sewerage works in Boston, presents such a reflex of the errors in principle committed in common British practice, most of them, no doubt, carried over from England, that I have begged for the loan of the woodcut illustrations, to reprint with the report, for instruction here, and the State Board has been so kind as to lend them for the purpose.

I am glad, however, to learn that sanitary science in construction is being taken up as a specialty in the United States, and I believe, from the report of Mr. G. E. Waring, jun., of Newport, on the condition of Washington, that if the principles he propounds are taken up by the Government there, for putting its seat in a proper condition, as an example to other cities in the Union, the United States Government may set an example to our Government of what may be done even for the British metropolis. He shows, what has long been shown for London, but not done, how the damp of its surcharged site may be removed by subsoil drainage; how a system of circulation may be introduced, and one of stagnation removed. He would carry in the pure water direct by a constant supply, without cisternage and without stagnation, and would remove all the fouled water, and all the excretory matter from the houses, by self-cleansing drains, and from the town by self-cleansing sewers. He would remove storm-water by separate channels to the river, and not mix it with the discharges from the house and create a necessity for large man-sized sewers accumulating stagnant deposits, or extended cesspools such as those under the Metropolitan Board of Works or the Vestries in London, in which the putrefactive matter is kept for weeks and months, giving off the noxious products of decomposition, and diffusing them into houses and streets. He proposes that all waste organic matter should be delivered at the mouth of the sewer at least within twenty-four hours of its production. I believe that it may be done in less time than that at Washington. To do this there must be a proper adaptation of the sizes of the drains and sewers to concentrate the flow of the fouled waters, and to make them self-cleansing. In exposition of the ignorance which is prevalent there as well as here, he states, for example, "that the particular idea of the size of a drain required to receive the drainage of a house or of a number of houses is strangely in error. A pipe, 6 in. in diameter, having an inclination of 4 in. in 100 ft., has a capacity of discharge of nearly 200 gallons per minute, say 12,000 gallons per hour, or, between eight and eleven in the morning, 36,000 gallons. It is usual to estimate that during the three hours about one-third of the daily flow is discharged. Such a pipe, then, at such an inclination, would be adequate to the removal of nearly 150,000 gallons per day. If each household averages six persons, and if the daily consumption is even 50 gallons per head, the service would suffice for 500 houses; or supposing the sewer to run only half full, for 250 houses." Here, in London, it is common to put down drain-pipes of that size for single houses. "It is to be considered, also, that it is rarely necessary to lay a sewer with so slight a fall as 4 in. in 100 ft., and that an increase of fall secures, of course, an increase of discharge. During the past year, under the direction of the National Board of Health, I have made a number of gaugings in different parts of the country, to determine the actual practical dry-weather flow of the public sewers during the hours of the greatest use." Our local sanitary authorities would do well to follow this example. He says the result of these gaugings fully sustains the estimate thus given. "Generally, where from 50 to 100 houses contributed to the sewer, the discharge filled a 6-in. pipe from less than 1 in. to 2½ in. deep. A sewer in Milwaukie, draining an area of about 75 acres, and serving a population of over 3,000, had the whole of its flow through a 6-in. pipe, which it did not entirely fill. A sewer in St. Louis, draining a district of over 11,000, had its entire flow through a 12-in. pipe, which it only about one-half filled. The belief is very general that if a given flow of sewage can be discharged through a small pipe, it can surely be discharged through a large one. This is not true. The whole sewage, solid matters and all, will be completely removed by a small sewer, while only the liquid portions and the smaller solids will be removed by a large one. The solid matters, beyond the capacity of the broad and deep stream to move them, remain as a deposit in the large sewer, always subject to decomposition, and often liable to obstruct the water-way, to lessen the already slight scouring capacity, and to invite further deposits." In this metropolis, there are estimated to be upwards of 1,000 miles of sewers of deposits—extended cesspools—chiefly under the management of the vestries, that serve as dire demonstrations of these truths, as well as the house-drains in the common conditions described in the annexed report. It will be found in the United States that by following out the principles set forth, three houses and three towns may be generally drained well at the cost heretofore incurred in draining one ill.

EDWIN CHADWICK.

COMMON DEFECTS IN HOUSE-DRAINS.

The purpose of this paper is to state what are the common defects in house-drains, and to show the usual forms and condition of such drains as they exist in our cities and towns to-day. The statement is chiefly based on observations made in Boston while constructing intercepting sewers; but it is assumed that examinations in other cities and towns of the Commonwealth would reveal a condition certainly no better, and probably worse. Some testimony will be offered from those whose occupation has given them opportunities for observation; and, while it is not intended to cite exceptional cases of defective arrangement or construction, a few characteristic examples will be given, such as investigation would prove to be very common.

What are the essential conditions of an efficient house-drain, one or more of which must be violated to constitute a defect?

Briefly stated, they are, that the drains must be of size and shape to concentrate its flow, smooth inside, suitably inclined, tight, properly connected with the house-pipes and sewer, strong and durable in material. It is of great importance that the portion of the drain within the house should always be in such a position as to admit of ready inspection at any time; it should be in sight,* and not concealed. Let us see what proportion of Boston drains reasonably fulfil these conditions.

Existence is perhaps the most essential condition of a drain; and, by an Hibernicism, non-existence may be termed its most serious defect. Naturally, non-existence was not observed in digging for the intercepting sewers, but there is sufficient evidence that it is not unknown.

The writer has seen a case where a drain-pipe from a dwelling ran through the walls, and there ended. Several similar cases have been reported to him; and another, where a block of six expensive houses, occupied for months with all the customary apparatus in the way of plumbing and waste-pipes in full operation, had no drains beyond the walls to the street-sewer. Such cases are rare, and generally reveal themselves quickly; but it is more common to find drains which are so solidly filled with earth, grease, and other matter, as to exist only in name, and which, for any good they accomplish, might just as well not exist at all. One, examined by the writer some months since, had apparently had nothing through it for years, the whole waste from the soil-pipe having accumulated beneath the cellar-floor. The same state of things was found to exist below the Rockland Bank Building in Boston. A case has been mentioned to the writer where it is thought that three deaths can be directly traced to the stoppage of a drain which was so clogged as not to act. Almost every one who has been led into this line of inquiry has some similar instance to relate, and evidence could be multiplied indefinitely. Of the house-drains crossing the intercepting sewer-trench, during its construction last season, fully 25 per cent. were almost or entirely choked with sludge.

An example of semi-existence, observed while digging for the sewer in Charles-street, is worth noting, as showing the intelligent judgment sometimes exercised in doing this kind of work. It will be understood by referring to the sketch (fig. 1). The drain was one for surface-water; and the drain-layer, in digging from the house towards the sewer, came upon a log lying across his trench, and here stopped short, chopped a hole in the log, found it hollow, and connected his drain to it without going farther. It is true, the log led to no outlet, but then it saved trouble,—to the drain-layer.

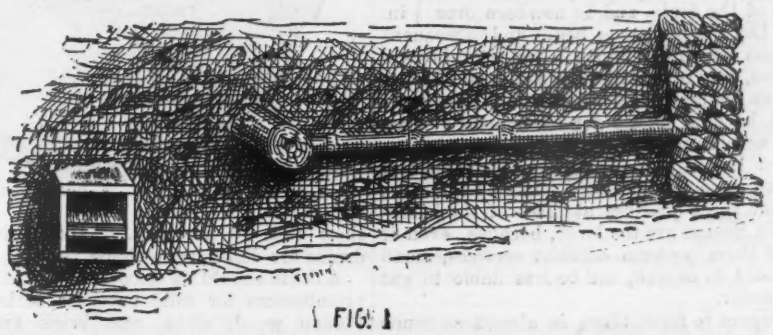


FIG. 1

As to the question of the size of drains, it was found that of 113 observed while building sewers the past year:—

11	were about	4	inches	in	diameter.
4	„	„ 5	„		„
21	„	„ 6	„		„
5	„	„ 7	„		„
27	„	„ 8	„		„
8	„	„ 9	„		„
11	„	„ 10	„		„
26	„	„ 12	„ or over		„

The sketch below (fig. 2) illustrates the wide range of this diversity. Most of them drained

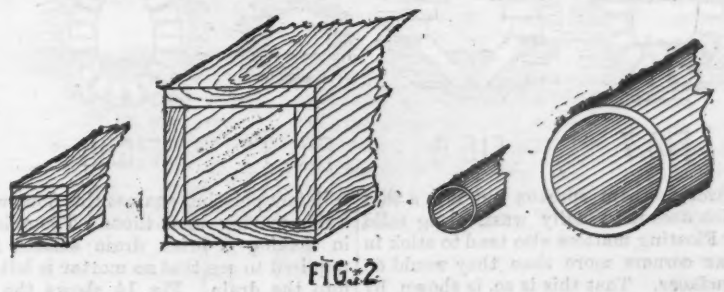


FIG. 2

single dwellings similarly situated; and if the

* The same rule applies, of course, to soil-pipes, although that part of the subject does not come within the scope of the present inquiry.

small ones were large enough the others must have been unnecessarily large, and *vice versâ*.

But what is the proper size?

Probably nine engineers out of ten would answer, "By no means larger than 6 in."; and nine drain-layers out of ten would now say, "Never smaller than 8 in." The former argue that the drain need only be large enough to pass through it all that it can reasonably be expected to carry, and that anything beyond this tends to make the ordinary flow spread thinly over a wide bottom, without a sufficient depth to carry solid matters along with it. The latter reply that, in fact, a drain never does receive only what can reasonably be expected; and that, the larger the drain, the more storage room for the unreasonable accumulation of clothing, tin and glass ware, dead animals, &c., usually found in it. "In practice," say they, "large drains take longer to choke up than small ones, and are therefore better."

Their facts are correct, but their conclusions may be doubted. In building a drain, the object should be to prevent the beginning of a deposit; and this is much easier in a small drain than in a large one, as will be understood from fig. 3,

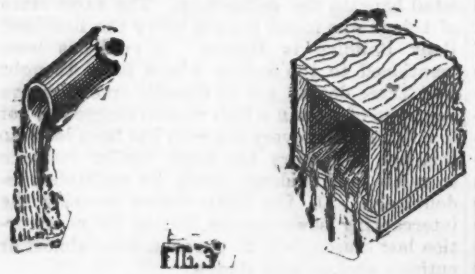


FIG. 3

where an equal quantity of water is supposed to be flowing in a 4-in. and a 12-in. drain. It might be thought (by one who thought at all about such matters) that the discharge of a great volume of water, as from a bath-tub, would tend to scour out and clean a drain. So it might a very small one. But in such a structure as our sketch represents, with a flat bottom 12 in. wide, the stream caused by such a discharge would probably meander over the bottom of the drain, and be nowhere over ¼ in. deep. Let a deposit once begin, and subsequent accretions as surely choke a large drain as a small one, only it takes longer to do it. And it may even be questioned whether it is an advantage to be able to use for an additional year a drain nearly full of putrescent filth, or whether it is not better to have the evil disclosed and remedied as soon as possible. It may safely be said that three-quarters at least of the house-drains in Boston are too large, because, even if some of them perform efficient services, small ones would do as well, and be less liable to get out of order.

In respect to form, there is almost as much diversity as there is in size. Figs. 4 to 10 give the more common shapes.

The first three must be condemned at once, on account of their flat bottoms. The water

FIG. 4 FIG. 5 FIG. 6

FIG. 7 FIG. 8 FIG. 9 FIG. 10

passing through them spreads out into a thin sheet, which does not readily wash along solid matters. Floating matters also tend to stick in the angular corners more than they would on rounded surfaces. That this is so, is shown by the record. Of the 113 house-drains whose condition was noted, 45 were constructed with flat bottoms; and of these 26 were choked, or nearly so with sludge; 19 were reasonably clean. Of the remaining 68, which had rounding bottoms, 12 were full, or partly so, of sludge; 56 were reasonably clean. The common appearance of these flat-bottomed drains, as they were uncovered, is shown in figs. 11, 12, and 13. Figs. 13 represents the condition of a drain, now disused, which came from the City Hospital grounds.

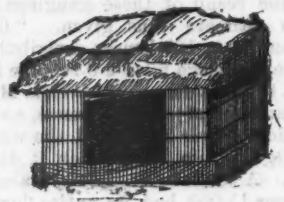


FIG. 11

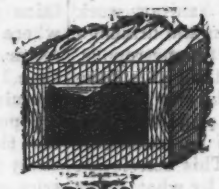


FIG. 12

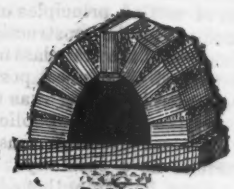


FIG. 13

The shapes shown in figs. 7, 8, 9, and 10 are unobjectionable, although, in fact, these drains were often too large, and had other defects. Fig. 8 is a kind of construction which was in vogue twenty-five years ago; and, except for liability to open joints, its angular bottom and its size is passably good. Our facts seem to show that 40 per cent. of the Boston house-drains are defective in shape.

A drain should be smooth, so as to afford no prominences for solid particles to lodge upon. Planed wood, slate, and brick are smooth enough. In use they soon become covered with a film of slime that makes them very slippery. Unplaned wood, which until recently has been somewhat used, is apt to be rough, and to have splinters pointing against the flow, which catch solids moving upon them. The chief difficulty in making a brick drain smooth is the care required to see that no mortar is left projecting into the drain. Fig. 14 shows the manner in which such work is often finished.

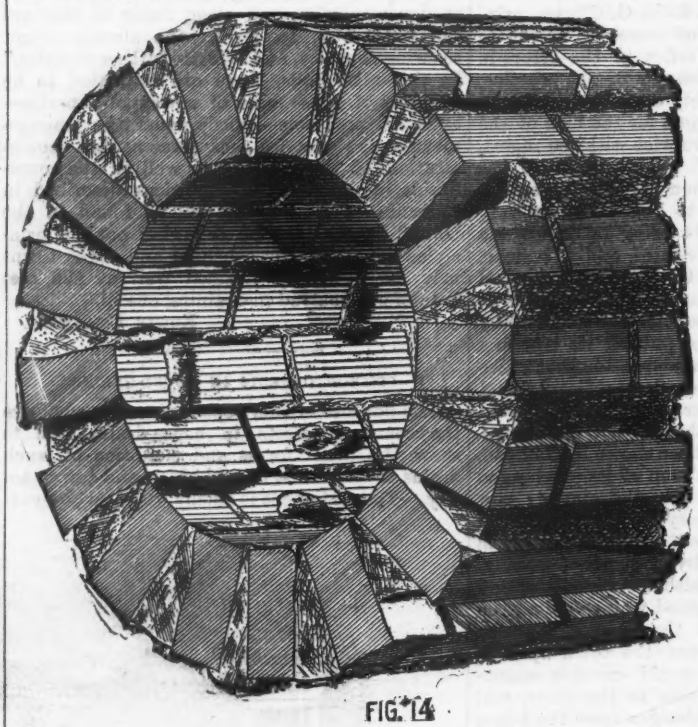


FIG. 14

It is possible to strike each joint of the lower half of the drain so as to leave a reasonably smooth surface; but a difficulty harder to avoid is caused by portions of the mortar uniting the arch-bricks falling when the supporting centres are removed. These lumps of cement, indicated in the sketch, adhere to the bottom, and, unless carefully scraped off, harden, and form serious obstructions to the flow of sewage.

Pipe-drains, whether cement, clay, or iron are smoother than those of brick. Glazed clay pipes are especially smooth. In these, however, it is very common to find the mortar uniting the several sections of pipe projecting into the interior, forming a series of little dams which obstruct the flow. Fig. 15 illustrates this. This can be avoided by carefully cleaning the interior of each pipe, after laying it, with a swab or hoe,—a simple precaution, but often neglected by a careless drain-layer. It will not be an exaggeration to say that three-fourths of existing drains are defective as to their smoothness.

The best rule in practice for the inclination of a house-drain is to give as much pitch as is possible, and in few cases is less than ½ in. to the foot safe. A great many drains are faulty in this respect. The actual inclination of drains crossing the trench of the intercepting sewer the past year was not taken; but of the 113 met with nine are recorded as level, and fourteen as pitching the wrong way, that is, towards the house. One of these, coming from a public school building, was about 7 in. lower at the curb-stone than at the sewer. The condition of such a drain is shown in fig. 16.

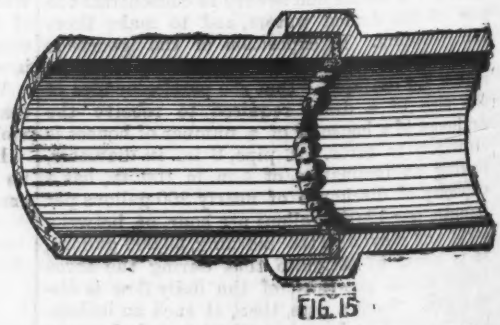


FIG. 15

The water stands in the depressed portion of the drain to the height of its connexion with the sewer, and having little motion deposits are apt to occur. In the case referred to it is but fair to say that the school-drain was clean, so far as seen. Very possibly an abundant use of water or recent heavy rains had scoured out any deposit that may have taken place. It is probable that most of this inclination in the wrong direction occurs in the street, near the sewer. The drain-layer frequently begins to put his drain simply with reference to the house, without inquiring what is the elevation of the sewer into which it is to empty. He digs his trench towards the street, and lays his drain on a slope which he judges by his eye to be sufficient. This in itself is a deceptive matter, as a trench generally seems to slope down towards the observer. When the sewer is reached, it is found to be higher than the portion of drain already laid. What is to be done? It is not the drain-layer's fault that the sewer is so high. He cannot take the trouble to dig up his pipe again. It is only a few inches any way, and the pipe is run up and connected, the trench filled back, and, "out of sight out of mind."

It was stated that one of the essentials of an efficient house-drain is that it shall be tight.

Mr. Ernest Bowditch has called the writer's attention to a condition in which, at first sight, a leaky drain might appear better than a tight

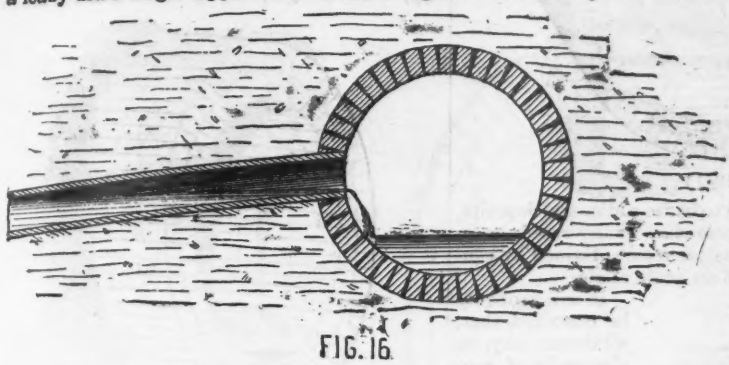


FIG. 16

one. He says, "It is sometimes noticed, when plumbing is from twenty to twenty-five years old, and where all the drains outside the cellar-walls are of open stone (technically French drains), the soil-pipe not being ventilated, that there is no perceptible leakage of sewer-gas into the house. It is reasonable to suppose that in these cases the gas generated outside the house works up through the soil, rather than force the traps of the house. The modern method of tight drains and cesspools tends to drive all gases into the house. It is frequently more important, therefore, that recent plumbing should be ventilated than that of older date.

Both tight and open drains tend to produce evils; but those arising from a tight drain can be obviated by proper ventilation of the house-pipes, while the evils from leaky ones are irremediable. Therefore, we say, drains should be tight, that sewer-gas (or what is worse, matters capable of producing sewer-gas during a long decomposition) may not escape; and also that water may not leak out, leaving the solid contents of the drain stranded.

This want of tightness is the commonest defect of all, and probably three-quarters of the annoyance from drains is due to it. In the annual report of the Boston City Board of Health for the year ending April 30, 1878, is given the result of examinations of 351 house-drains in different sections of the city. Of these, 193, or 55 per cent., are reported as defective; and in nine cases out of ten the defect consisted in the drain not being tight. This defect, more than others, affects the better kind of houses.

Mr. Theodore Clark, who has had experience with this class of dwellings, speaks thus of earthenware and cement drain-pipes:—"These, I think, rarely remain tight many years. Even where the drains are laid with the greatest care, I have observed that water will often, in course of time, make its way out around the joints between the pipe and the ring of cement. When broken it is found that the cement has taken a perfect mould of the pipe; but either from some greasiness, or possibly a little dust on the pipe at the time of laying, it has failed to adhere, and water has ultimately forced its way through. An accumulation of water caused by an obstruction in the pipes will often search out such places, which must have previously allowed gas to pass freely. Another very frequent source of trouble is the settling of the ground under and around the drain-pipes. In houses with drains originally in perfect condition, their joints will frequently, in a year or two, be found to be separated, the pipes cracked, or the branches settled away from the soil-pipes which enter them. In either case the drainage saturates the ground about the defective places with matter, whose effluvium will penetrate even concrete.

In my experience, defects of this kind are far more common than leaks in iron soil-pipes, imperfect traps, or other defects attributable to the plumber; and the earthen drain-pipe should generally be first examined in searching for the cause of unpleasant smells in any part of a house, as effluvia originating in the cellar often find their way through furnace-pipes and behind furrings to the remotest corners of a building."

In this connexion may be cited several cases recently reported, in each of which a smell was noticed whose source it seemed impossible to locate, until at last a leak was discovered in the drain, directly communicating with the cold-air supply-pipe of the furnace, which latter, of course, acted as a distributor of the gas through the entire house. A similar leak into the air-duct of the Boston City Hospital proved a source of serious illness, and probably of increased mortality, among the surgical patients, until remedied in course of the various improvements introduced by Dr. Cowles.

Leaky drains are due to a variety of causes. In a brick drain the joints between the bricks may not be solidly filled with mortar, the mortar may not adhere to the bricks (a common result of not wetting the latter before laying), the bricks themselves may be shaky or rotten, or the structure as a whole may be broken by unequal settling. In some drains no attempt is made to have tight joints. A kind much built some years ago, and of which many examples

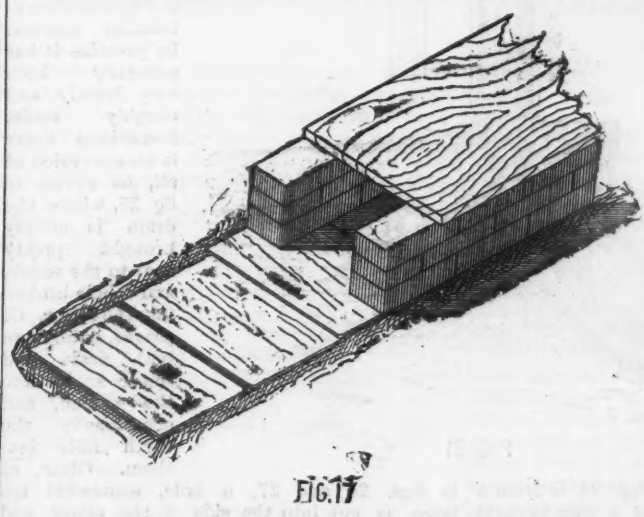


FIG. 17

remain, is shown in fig. 17. In this the bottom is made of roofing-slates placed side by side, or sometimes overlapping, but never

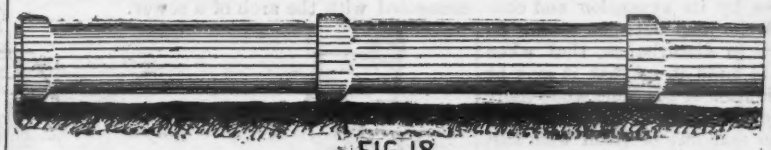


FIG. 18

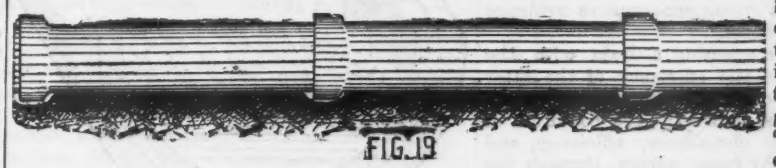


FIG. 19

with anything to prevent water percolating through the joints into the soil below. Fig. 17 reversed, with plank below and slates above,

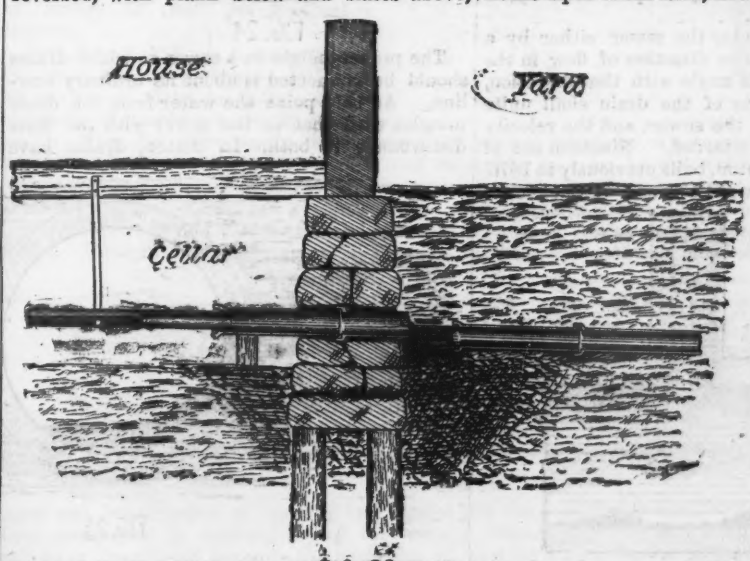


FIG 20

would resemble more than half the drains on Beacon-hill as they were originally made, and still exist. A plank drain may leak through open joints, variously caused through knot and nail holes, and by the rotting of the wood where it is not constantly wet. A pipe-drain may leak from bad joints, from flaws in the pipe itself, or because it had been broken. The breakage is generally due to unequal settling, sometimes to defective pipes, and occasionally to improper methods of laying them. The sections are sometimes carelessly or ignorantly laid on the bottom of the trench, resting merely upon their flanges as shown in fig. 18, instead of upon their entire lengths, with depressions dug out for the flanges, as in fig. 19.

In the former case, unless the dirt be rammed back beneath the pipe with unusual care, the pipe acts as a beam resting on supports 3 ft. apart, and is liable to be broken by the superincumbent earth, or by any shock, as of a body falling, or a wagon jolting over it.

As the greater proportion of leaks are caused by defective joints, it follows that a brick drain with joints every inch or two is more liable to this defect than a clay or cement pipe with joints 2 ft. or 3 ft. apart, and that iron pipe in 5 ft. lengths is less liable to it. A place where a leak frequently occurs, especially in a house built on made land, is where the drain passes through the cellar wall. If the foundation wall is supported, and the ground on either side settles, a condition of things is produced shown in fig. 20.

A drain may exist in such a state as this for months, or longer, without detection. The water follows the wall, perhaps into neighbouring houses, saturates the ground in the vicinity, and finally finds an outlet through some pervious stratum, or into some well. If the cellar be examined, little moisture may be apparent—an ill-defined odour to which the family become accustomed, and about which visitors feel a delicacy of speaking, being the only suggestion of trouble,—until finally, perhaps, may come some "unaccountable" sickness, or "mysterious visitation of Providence." Mr. W. H. Bradley, Superintendent of Boston Sewers, spoke thus of this matter three years ago, in a communication to the city government:—"The number of drains leaking under houses and into foundation walls is very large; it is almost certain to occur with every house upon made land, and is always neglected by owners and tenants till it becomes insupportable; and with sickness traceable to such causes, and continued discomfort prevailing, the parties most interested still wait for the city to carry out costly general measures, thinking thus to abate their private nuisance. As a rule, a bad smell in a house means something wrong locally, and should be stopped in a day."

The examinations of house-drains, before referred to, made by the Boston Board of Health, which aimed at the discovery of leaks by the use of strong-smelling volatile oils, show that more than one-half of the Boston drains (and

the proportion would probably not be less elsewhere in the State) are defective from want of tightness.

A drain should be firmly and properly connected to the sewer at one of its ends, and to the soil-pipe (if this connexion be within the house, as it almost invariably is) at the other. More leaks probably occur at the other place than at any other. The inspectors of the Board of Health, after pouring a little oil of peppermint into an upper water-closet, most frequently recognise the familiar odour at this point. Sometimes there is not even a pretence of making a tight joint, the soil-pipe being merely inserted loosely into the drain. In other cases the joint, intended to be tight when made, through careless construction is not so; and again having been tight when made, it may have been injured since. Fig. 21 is from a sketch made by Mr. Bradley of a case brought to his attention, existing in the house of a Boston physician. The drain may settle away from the pipe, or the pipe may settle into the drain; an iron pipe by its expansion and contraction may break the joint between them. So liable is this place to disturbance, that when possible it is well to build it so that it may be accessible to examination at any time when there is the least suspicion of wrong. Rats frequent drains, and dig into and out of them with surprising facility. An influx of rats into a house should be taken as strong presumptive evidence of a defect in the drain.

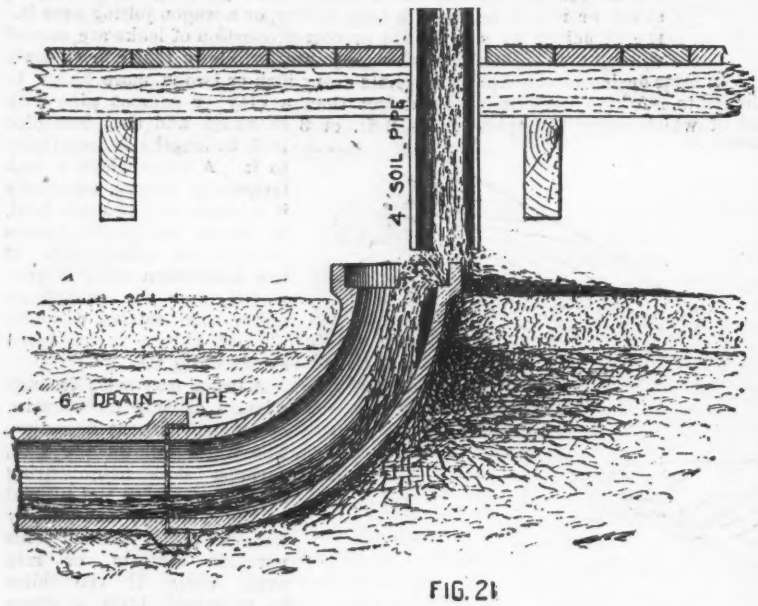


FIG. 21

The mode of connecting a drain with the sewer affects more the efficiency of the latter than it does directly the sanitary condition of the house. But as, indirectly, the condition of the sewer as to cleanliness, efficiency, and liability to generate gases, affects, through the drain, every house connected with it, the proper junction of the drain and sewer deserves a degree of attention which, till quite recently, it has seldom received.

A drain should enter the sewer either by a curve tangential to the direction of flow in the sewer, or at an acute angle with that direction, so that the contents of the drain shall unite readily with that of the sewer, and the velocity of neither be much retarded. Nineteen out of twenty drains in Boston, built previously to 1876, enter the sewer at right angles. The effect of such an entrance from the top or side it is attempted to show in the sketches (figs. 22 and 23), where the tendency to arrest the flow in both structures, and to cause eddies and deposits, is shown in a somewhat exaggerated way. Fig. 24 shows the better result attained by connecting the drain at an acute angle.

FIG. 22

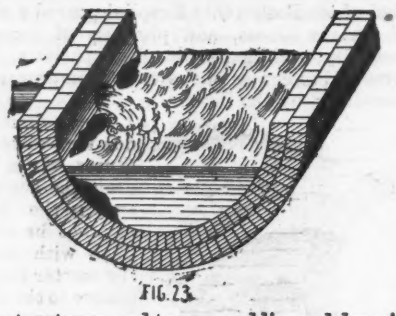


FIG. 23

It will probably be conceded that, whatever may be the mode of connexion between drain and sewer, it should be made in a firm and workmanlike manner. In practice it has generally been very loosely and roughly made. Sometimes there is no connexion at all, as shown in fig. 25, where the drain is simply brought pretty near to the sewer, and a hole broken into the latter. Of course, water from both drain and sewer soaks into the ground, and occasionally the earth falls into them. Often, as in figs. 26 and 27, a hole, somewhat too large, is cut into the side of the sewer, and the pipe pushed through, and allowed to project, more or less, into the sewer. Fig. 28 shows the rough way in which pipes are often connected with the arch of a sewer.

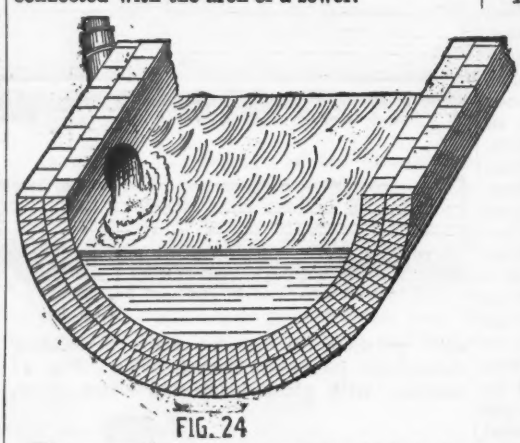


FIG. 24

The proper height in a sewer at which drains should be connected is about its ordinary flow-line. At this point the water from the drain mingles with that in the sewer with the least disturbance to both. In Boston, drains have commonly entered the sewers wherever they happen to run against them. As a general rule, they are too low (fig. 29); and water from the sewer backs into them, making a sluggish current. Their being too low might be expected from what was shown in connexion with inclination of drains; and this results largely from an effort to drain cellars into a sewer higher than the cellar floors. Occasionally, a drain-layer, having found a sewer much

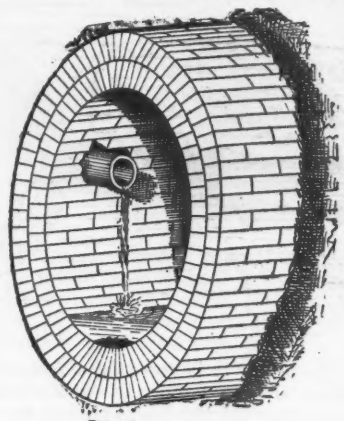


FIG. 26

lower than he expected, has dug vertically to it, broken a hole in the top, and around the hole erected a chimney with which to connect his drain (fig. 30). Often the hole into the

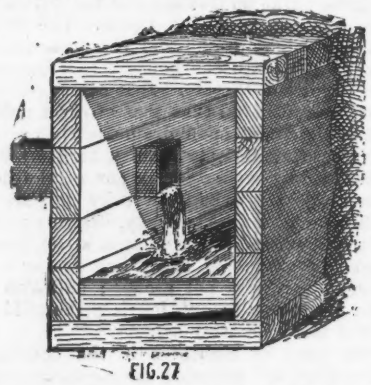


FIG. 27

sewer is much smaller than the drain which empties through it (figs. 31 and 32). In such cases there are shoulders around the hole, on which solid matters accumulate.

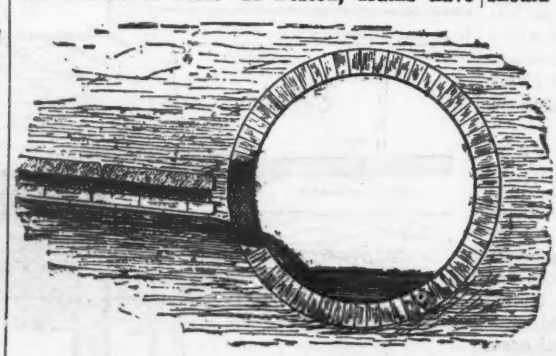


FIG. 25

The sketches that have been given exhibit what until very recently has been the method, or rather lack of method, of making connexions with the sewers of Boston; and it is supposed that the manner of doing such work elsewhere in the State has been very similar. In Boston there has been an improvement in this respect during the last three years. The superintendent of the sewers, realising how much the efficiency of his charge was impaired by the way in which house-drains were frequently connected with the sewers, obtained, against considerable opposition, authority to require that any future connexions should be made under his inspection. His regulations require junctions to be made with slants and curves, as shown in fig. 33; but of the total number of existing drains, the proportion so connected is very small. Speaking generally, it may be said that almost all the drains in old Boston are defectively connected with the sewers they enter.

The material of which a drain is composed should be durable, both on account of true economy, and, what is more important, because, being generally out of sight, any decay or failure in it is not readily discoverable. For the same reason that portion of the drain within the house should never be put where it cannot be easily examined in case there be any suspicion of trouble. The materials most generally used for drains are brick, stone, slate, vitrified clay, cement, wood, and iron.

Bricks made of good clay thoroughly burnt all the way through, are among the most enduring of building materials. But all bricks are not so enduring. From some kinds of clay good bricks cannot be made. In every kiln of bricks there are some which are not thoroughly burnt. A soft brick will rot and disintegrate in water. Therefore, while, as regards durability, bricks may be said to be a perfectly suitable material for drains, the statement is only true

provided great care is used in selecting them. Building stone and slate, often used for the tops and bottoms of drains, are generally durable (though there are instances of slate disintegrating in the course of years); but there are other reasons why their use is not to be commended.

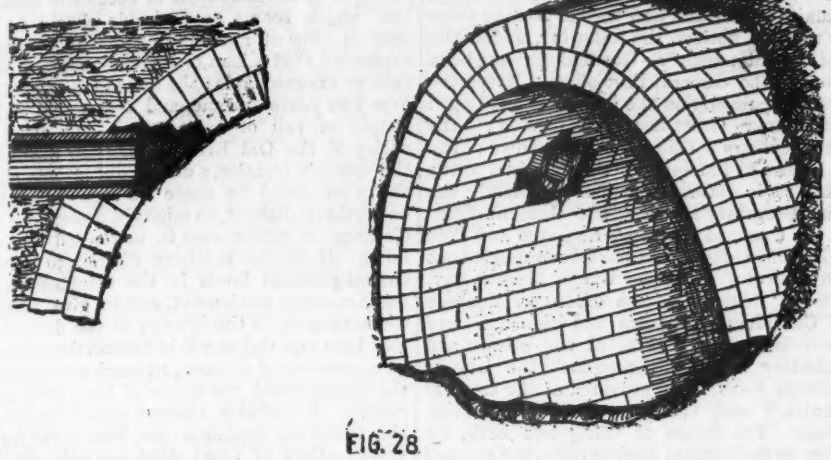


FIG. 28

What has been said about bricks applies to the clay drain-pipe (now so commonly used), to a degree not usually recognised. Too frequently one hears Akron pipe spoken of as though it possessed unvarying qualities. It should be remembered that such pipes are burnt in a kiln very much as bricks are. Before burning they may be air-checked; like bricks, the pipes nearest the fire may be warped or fire-cracked; those higher up may be less thoroughly burnt,

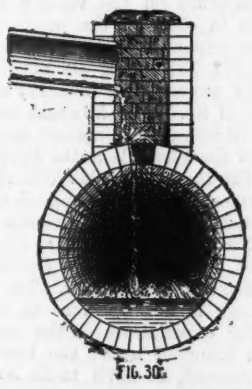


FIG. 30.

corresponding to "light-coloured bricks." Others may be quite soft, and imperfectly glazed, or the glazing may scale off by "popping."

Slip-glazed pottery pipes are still more liable to defects. They are made of a different kind of clay, and, being burnt at a lower temperature, are usually more porous and less hard. The glazing, which is formed by dipping them before burning into a thin mixture of argillaceous earth, forms a skin over the pipe, which at times peels off under the action of frost, acids, or hard usage. While either kind of pipe, if well made, is durable enough, poor samples of each were occasionally noticed while constructing the intercepting sewer. It is important that in using them for house-drains care should be exercised in their selection.

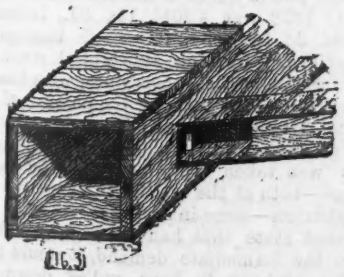


FIG. 31.

Without going into the vexed question of the comparative merits of clay and cement pipes, it is sufficient to say here of the latter, that while they can be, and often are, made so as to be very durable, yet cases where they have failed and disintegrated are frequently reported; and it is extremely difficult to judge from their

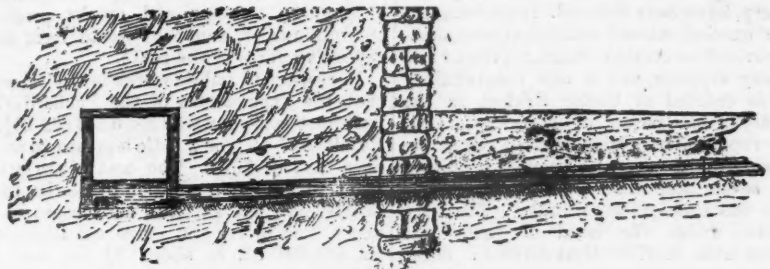


FIG. 29

appearance whether they are good or not. In resisting the acids or alkalies, they have been proved far inferior to well-burnt bricks or clay.

It is not easy to shape wood into the proper form for a drain. If it is always kept wet, as in the bottom of a drain constantly in use, it will last an indefinite time. Where it is alternately wet and dry, as in the sides or top of a drain, it is sure to decay sooner or later. Of those seen last year, the report concerning many is, "rotten," "could not be held in place," "fell to pieces when handled," &c. The state of one such drain observed by the writer, in which the cover had partially rotted away, and earth fallen in, is given in fig. 34. Unless there are exceptional conditions, the use of wood for house-drains must be condemned on account of its liability to decay, as well as for other reasons.

The use of iron as a material for the construction of house-drains is of too recent date to permit of an absolute statement as to its durability. Thus far there seems little reason to doubt that it is suitable in this respect; and its many other merits will probably lead to its more extended use for this purpose.

Sanitary science, as it now exists, is of recent origin. Until within twenty years the arrangement and construction of sewers and drains were committed to mechanics and labourers, and were considered beneath the attention of educated men. Interest in the subject was first excited through the discovery by the medical profession, that a large class of diseases (thereafter called filth diseases) was induced by the presence of gases arising from defective drainage.

To investigate and cure the inefficient methods and appliances which caused these gases, lay within the province of the engineer; and hence sanitary engineering and sanitary engineers came into existence. These latter devoted themselves with ardour to unearthing evils and devising remedies for them. Like new brooms, they attempted to sweep clean, and to purify at once the Augean stables they had discovered. But, like all reformers, they were sometimes carried away by their discoveries and theories, so that occasionally public opinion has re-acted against an exaggerated presentment of the evils of bad drainage. People have replied, "Nonsense! things cannot be in such a desperate condition, or the human race would have died out. Our fathers lived comfortably to a good old age without bothering their heads about drains, ventilators, or traps; and we are willing to take our chances."

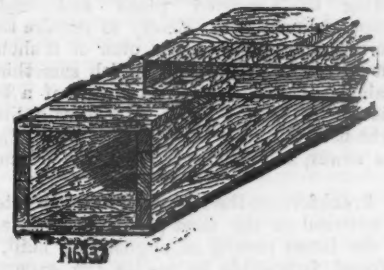


FIG. 32

It might be answered that our fathers did not have our intricate apparatus for drainage to bother themselves about. Neither did they put on double windows, and ventilate their houses through their cellars, nor connect their drains with their sleeping-rooms, as we do. The writer has no wish to be an alarmist. The risk from sewer-gas is probably not so great as many suppose: it is a slight risk, but a slight risk of a terrible danger. If a man thinks there is no need of insuring his house because his father lived in it for fifty years without a conflagration, he has a right to his opinion. What has been given in this paper, besides a few general principles, is a simple statement of what exists as seen by the writer and others. The question of plumbing has not been noticed, because the writer is not especially qualified to discuss it. He merely speaks whereof he knows, and the evidence is submitted without argument for the consideration of those interested.

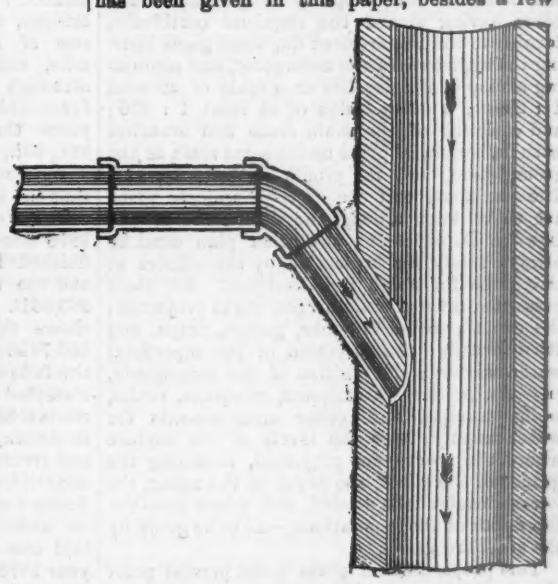


FIG. 33

FIG. 34

Should any one, admitting the evil, ask concerning a remedy, the answer is twofold. For the defective drainage which already exists, there can probably be no immediate radical relief; it can only come as people learn to

appreciate the danger of sickness and the value of health. When householders become sufficiently interested to wish to know where and what their drains are, and to make a few investigations with bottles of peppermint and otherwise, then will the better day be at hand.

As to what may be done to prevent an increase of bad work, a suggestion is offered. It is safe to assume that every man who builds a house for himself desires that its drainage shall be fairly efficient: unfortunately, it is not equally safe to assume that he will spend the time, thought, and money necessary to make it so. Now, since a defective house-drain may affect not only the owner of the house, and his family, and all who may thereafter reside there, but also the whole neighbourhood, would it infringe on personal liberty too much to reqnire that the house-drain, if no more, shall be built according to approved plans and under municipal inspection? Merely to require that before beginning such work a plan of it should be put on record would accomplish something. In drainage, to have some plan, even if a bad one, is better than none. It insures a little thought beforehand, a knowledge of the height of the sewer, and an adaptation of the drainage to it.

In Frankfort-on-the-Maine, which has lately been sewered on the most perfect system, and with the latest results of engineering skill, it was found impossible to realise the expected benefits unless some control was exercised over house-drainage. In that city, connexion with the city-sewers is not compulsory; but if any one desires, as nearly all do, to drain into them, it is required that detailed plans in duplicate, showing everything to be done, shall be filed, one with the Board of Works for its approval, and the other to be kept at the house. The whole work is done subject to its constant inspection of materials and workmanship.

In the eighth annual report of the State Board of Health, January, 1874, pp. 130–132, are given the conditions under which buildings, &c., are allowed to be drained into the new sewerage system of Frankfort. The plans to be filed are referred to thus:—"Whenever the drainage of any house, yard, &c., is projected, the owner of the property in question must, after having signed the requisite certificate, furnish to the Department duplicate plans bearing the signature of the contractor, and containing a map of the locality on a scale of at least 1 : 2,500; a ground-plan of at least 1 : 250; and a sketch of the main drain and branches with its horizontal plane on the same scale as the ground-plan, and its profile at least 1 : 125. The certificate and one of the duplicate plans are to be kept among the documents of the Sewage Department; the other plan must be always ready for inspection by the officers at the place for which it is designed. All plans presented must contain all the works projected; the exact position of sinks, gullies, traps, and other details; the direction of the superficial water-carriers; the position of the rain-spouts, cisterns, privies, waterclosets, cesspools, vaults, wells, pumps, and other arrangements for water supply; also the levels of the surface where the works are projected, including the grades of the latter, the depth of the cellar, the lowest levels of the ground, and, where possible, the depth of the foundations,—all to be given by the standard grade."

This preparation of plans is the pivotal point about which centres the whole regulation of private drainage. Its effect is, probably, that, as the owner and mechanic are unable to make the plans with the requisite nicety and accuracy, they are prepared by an engineer familiar with the proper designing of such structures. It will be noticed that this filing of plans is not to be a mere form, but that a duplicate is to be kept on the ground, to be constantly referred to in constructing the work.

The question of sewerage is forcing itself upon the attention of all our cities and towns. Boston has appropriated between three and four million of dollars for a system of interception, whereby its sewers shall discharge freely at all times, and their contents be diverted from the vicinity of dwellings. It is the first most important step, and, as the taxpayers feel, costs dearly. If the full benefit of this improvement is ever to be realised, it will only be when the house-drains and common sewers are rendered equally efficient, and the fundamental condition of perfect sewerage,—an uninterrupted removal of waste matter from the house to its final place of deposit,—is attained.

PUBLIC WORKS IN THE COLONIES.

FROM official papers, just published, relating to her Majesty's Colonial Possessions, we get some further interesting information concerning public works. In the report which refers to *Jamaica*, we read that, last year, the sums of 8,180*l.* and 10,999*l.* were spent, respectively, upon maintenance and new works. Among these works may be noticed the following, under the head of "Maintenance":—Gas-fittings have been provided at the General Post-office. Extensive repairs and painting on the following buildings: the Supreme Court-house, Kingston; the Island Secretary's Office, Spanish Town; the Court-houses at fourteen of the principal towns and stations in different parts of the island; the Colonial Secretary's Office, the General Post-office, the Customs offices at Kingston and Port Royal. Minor alterations have been carried out to the Collector of Taxes' Office, Morant Bay, and to the Customs House offices at Montego Bay. Considerable repairs and painting have been carried out at several of the prisons and constabulary stations throughout the island; gas-fittings have been provided at the General Penitentiary and the Constabulary Barracks, Kingston. The range of thirty-two cells, for females, at the General Penitentiary, commenced last year, has been completed, and handed over for occupation. Another range of forty-eight cells, for females, has also been nearly completed. The Deputy-Superintendent's quarter, at the General Penitentiary, commenced last year, has been completed. Extensive improvements, commenced during the last year, at the Stony Hill Reformatory, have been finished. Improvements have been carried out and additional accommodation provided at certain district prisons and constabulary stations, and a new constabulary station was erected at Ulster Spring, in the interior part of the parish of Trelawny. Considerable repairs have been carried out at the public hospital and several parochial hospitals, including seven hospitals that were formerly a charge on the immigration funds. The total expenditure, under the head of roads and bridges, has been 26,873*l.*, thus divided: maintenance and repair of main roads and bridges, 22,598*l.*; new works on the main roads and bridges, 4,275*l.*; total, 26,873*l.* The average cost of maintenance has been 30*l.* 9*s.* per mile, being the lowest rate since 1871-72, although the seasons have been quite as favourable as the average. In the previous six years the rates have been, respectively,—31*l.*, 33*l.*, 37*l.*, 49*l.* 16*s.*, 33*l.* 7*s.*, and 34*l.*

With regard to *New South Wales*, we learn that the total amount expended on the finished railways of the colony at the close of the year 1878 was 9,784,645*l.* The expenditure on unfinished lines to the same date was 493,206*l.*, and the sum expended in the year 1878 was 963,351*l.* The returns of roads and bridges shows that during the year 1878 the sum of 500,745*l.* was expended. This amount includes the following items, issued to trustees from unclassified vote, 5,343*l.*; trustees from minor roads schedule, viz.,—Northern District, 10,560*l.*; Southern, 8,679*l.*; Western, 5,042*l.* Harbours and rivers show an expenditure for the year of 218,001*l.* The actual amount expended on finished works of this class was 206,320*l.*, and on unfinished works, 672,717*l.* The amount laid out by the colonial architect during the year 1878 on public buildings of the colony was 263,446*l.* The cost of furniture for the year amounted to 13,401*l.* The expenditure for the year on sewerage works for Sydney was 21,906*l.*, which, with previous outlay, gives a total cost of 639,386*l.* The waterworks of Sydney show an expenditure for the year of 63,086*l.*, which brings up the total cost of this undertaking to 1,059,019*l.* The expenditure on both of these last-mentioned works includes salaries, interest, and other expenses.

In papers relating to *British Honduras* we find incidental allusion to the various projects in contemplation at the present time, viz.:—The Panama or Nicaragua Canal, the Mexican cable to connect the ports along the Pacific, and another to connect the Atlantic ports with Cuba, the Costa Rica and Tehuantepec railways, the new steam routes recently organised to these ports, the various companies forming to commence operations or undertakings in the neighbourhood, and the recent gold discoveries in Honduras. The present appearances of the colony beyond Belize, we further learn, are hardly inviting to a stranger. There are no roads beyond a few tracks which are impassable in wet weather, and bungays, doreys, or pit-pans comprise the means of water transport; yet there are few countries which afford so many natural highways. Rivers and pine ridges intersect the country in all directions, and intervening swamps or creeks are the only difficulties to be surmounted in road-making. Nor does the place present that example of advancement or successful colonisation which seems so desirable should be the case in view of surroundings. The opinion is expressed that a loan of 100,000*l.* does not seem rash or unreasonable; the amount is only a little over two years' income, and this would build a couple of rail or tram ways,—one along the valley of the Old River, connecting Belize with the western frontier, a distance of seventy miles; the other could be made through the southern or northern district, as might be determined: the distance in either case to be limited to thirty miles,—if in the southern district, to open up the magnificent lands in the neighbourhood of the American settlement, and to give access to the highlands in the interior in the direction of San Lins and Coban; if in the northern district, as a question of defence, as much as to develope the agricultural resources of that part of the colony. A portable railway would suffice, and the following estimate has been given for 100 miles:—Cost of plant, 400*l.* per mile, 40,000*l.*; cost of clearing track, 500*l.* per mile, 50,000*l.*; contingencies, 10,000*l.*; total, 100,000*l.* The estimate for constructing the roadway may seem unreasonable, but the pine ridges, which are hard, sandy, open plains, with necessary timber (*pinus rigida*) along the wayside, could be availed of for the greater part of the distance; intervening swamps and creeks present the only difficulties, and they would form the only expensive parts of the route.

In respect to public works in *Ceylon*, we learn that the expenditure of the Public Works Department last year was Rs. 5,553,639 00¾, being Rs. 495,627 57½, or a little less than 10 per cent., over that of 1878. The cost of the establishment, including, in addition to salaries, fixed and provisional, all salaries on account of allowances, transport, and office contingencies, was Rs. 408,891 02, or about 7½ per cent. on the expenditure upon works. Tables have been published which exhibit a classification of the expenditure, under the headings of "Establishment," "Construction," "Upkeep, Repair, and Improvement of Roads, Bridges, and Buildings," and "Irrigation Work," the funds from which the expenditure has been met, the expenditure incurred in the several provinces, and an abstract of the expenditure on the various classes of public works in each of the provinces of the island. The expenditure on irrigation works was Rs. 327,772 73½, being Rs. 113,485 25¾ in excess of the expenditure in 1877, and it includes a sum of Rs. 33,167 26 spent on the commencement of the very important work of the restoration of the Yodi Ela in the North Central Province. The Director of Public Works reports that the Pavilion at Kandy is in good order, and that the Queen's House at Colombo and the Cottage at Nuwarra Elliya require repair. The furniture and equipment at the Pavilion and at Queen's House are in fair order. The furniture at the Cottage is not provided at the public expense. The expenditure on the breakwater, which is not included under the head "Public Works," amounted, in 1878, to Rs. 560,945 05, bringing the total expenditure from the commencement of the work to Rs. 3,188,552 05. The work was advanced by an additional length of sea-wall of 326 ft., and by an additional length of harbour-wall of 343½ ft.

According to official statistics, the sum expended on public works in the *Transvaal* during the year 1878 was 4,904*l.* 15*s.* 8*d.*, including 1,150*l.* 8*s.* 3*d.* for repairs to roads throughout the province. Nothing substantial could be shown for the whole expenditure, with the exception of a cottage built for the curator of the Botanical Gardens, Natal. This, however, is easily accounted for, inasmuch as when the country was taken over, nearly all the public buildings—both at the seat of Government and in the districts—were in such a disgraceful and dilapidated state that had the exchequer been equal to the immediate demand, it would have been far cheaper to have pulled down the majority of the buildings, and built new ones. The chief items of expenditure were for such necessary additions and "patching-up" repairs necessary to keep public offices from the intrusion of burglars and the effects of rain and dust. A large outlay had to be incurred to render the magistrates' courts and other offices

fit for habitation internally, and for providing them with such scanty furniture as was necessary to carry on the work. In like manner the sum of 1,150*l.* 8*s.* 3*d.* was expended on the roads, if one can so designate the rude tracks which have been formed by the ox-wagons. This may seem an insignificant sum for such an object in a country larger than France, but it bears a favourable comparison with the amount spent by the late Republic, which averaged during the last three years of its rule 3*l.* 6*s.* 8*d.* per annum. The sum of 150*l.* 10*s.* had to be paid in part payment of a contract entered into by the late Government for the construction of a water-course at Christiana which, on examination, proved to have been so far badly executed that, had it to be redone and carried out under proper supervision, it could be completed at one quarter of the expense contracted for, viz., 3,000*l.* A large annual outlay is also entailed for rent of public offices.

FROM ITALY.

A FRIENDLY correspondent writes,—I left my country abode on the 19th, and started off to Chiusi, thinking to see there the nucleus of Etruscan art in its museum, and, to my horror, found it had been sold to Palermo. A museum at Chiusi still exists, but though interesting, is not larger than many possessed by private persons. In fact, I went to the house of a private gentleman, who pays experienced diggers to dig around in the tufa, and who sells the findings at high prices, he being depended on. I then started off to Orvieto. These old Etruscan cities are all built as near the sky as circumstances will permit. I did so long to see the façade of the cathedral there, and was not one atom disappointed, as one is so often when imagination has been for years dwelling on the beauty of some particular object. The drive up to Orvieto from the station is now over a fine road, that winds round and round up to one of the old gates of the city. The façade is certainly the finest of all the Gothic façades I have seen, and the brilliant colours of the restored mosaics brought out the soft colour of the lovely columns, and all the wonderful work around the portals. And those marvellous reliefs! How beautiful the front is. I was so sorry to be seeing it alone. Then the marvels of the interior,—the Fra Angelicos and Signorelli,—a group by the former of Fathers and Saints in a compartment of the roof of the principal chapel looks as if painted yesterday. There has been a deal of bad restoration, but now there seems a loftier spirit pervading the works, and as the funds fall in they will restore the two chapels. The windows of these chapels are of thin layers of alabaster, transparent. I started off one evening at six, in a carriage, with the proprietor of the hotel as guide, to visit the Etruscan painted tombs. We drove about ten miles down from Orvieto to the plain, then up on the other side, equally high, and then we waded along narrow paths, through brushwood and over ploughed fields, till we descended the side of the hill to find narrow passages cut in the tufa leading to the tombs. The freshness of the vermilion colouring of the figures, nearly life-size, with the grand black outline, is quite startling. A glorious full moon lighted us, but we had to carry candles in the tombs. They are carefully guarded by iron doors. It would be better if there were bars only to allow the outward atmosphere to keep the tombs dry. One grieves to see these treasures neglected. On the road I went to see the chapel of an ancient Badia, where there is an altar-piece by Signorelli that must go to decay soon, and in an old palace another in perfect preservation, of great beauty. I shall never forget that drive. We did not get back till half-past ten, and the moonlight was as day. And how I had walked!—but the interest was so great that the fatigue was lessened. Then there was the glorious wine of Orvieto to refresh one,—wine such as the Olympian deities must have drunk! The next morning at half-past seven I had breakfasted, and was off with my intelligent guide to see all we could of Orvieto. We went to an old church,—San Giovinele. The priest, an intelligent old fellow, had fancied that there might be something hidden under the thickly-whitewashed walls, so he began to scrape, and found his church painted in fresco all over the walls, and columns also. The brick pavement has been raised 1 ft. above the base of the columns. Behind the altar he found incrusted in the wall a square piece of marble, of old twelfth-century work; and near, pilasters still older, which he dug out and made into an altar, and the old man described the long ceremony, fasting, he had to go through when a bishop passed, who consecrated the new altar. The pilasters are pure Byzantine,—the front piece is obviously twelfth-century work; and, sure enough, we found a piece of the same in another part with 1127, or rather MCXXVII. on it. The frescos on the wall are quite Giottesque, and one old Madonna is Cimabüé to a touch. I longed to help to scrape off all the whitewash, for not an eighth has been uncovered. Is there no one who will help the poor old canonico with a little cash?

I went to the opening of the Donatello Society in Florence, which you have already mentioned.

You know that Firenze has her king here, and 32,000 soldiers, who have been doing the grand manœuvres and the review, and the Donatello Society thought it would give *éclat* to open while the king was here. So what pictures they had they hung. The king examined them minutely, talked a great deal, hoped a great deal, and praised ditto. Prince Amadeo did the like. This is a move to do good to Florence artistically. The prime mover is Léon Gaucherel, artistic director of *L'Art*. The *Builder*, I think, is the only journal that has made the Society known in England.

WORK AND THE WORKMAN.

THIS was the subject of an address, delivered to the members of the Trade Unions Congress on Thursday in last week by Dr. John K. Ingram, Fellow of Trinity College, Dublin. Taking as a definite type of the workman's life the form it assumes in the great centres of manufacturing industry, he proceeded to consider the general conception which they ought to form of the industrial functions, the relations which had to be regulated, and the moral ideas which ought to preside over that regulation. The whole modern organisation of labour in its advanced form rested on a fundamental fact which had spontaneously and increasingly developed itself—namely, the definite separation between the functions of the capitalist and the workman, or, in other words, between the direction of industrial operations and their execution in detail. The ascendency of wealth was deplored by some and if it necessarily meant what was properly known as plutocracy, the absolute domination of wealth, the prospects of society would be gloomy enough. But the use of wealth, as of every other social force, must be regulated and moralised, a task which ought to be easier than that of controlling the rude preponderance of military force which was its historical predecessor. The active rich, if they would conceive their position aright, must rise above the purely private point of view, and must regard themselves as discharging a true public function,—that of conservators and administrators of human capital. They could not claim to be the creators of this capital; the largest part of it was the fruit of the laborious economies, discoveries, inventions, and institutions of many generations. This conception of the capitalist as a social functionary heightened his dignity, entitling him to respect by virtue of what was really a public office,—a respect which could on that ground be shown by his inferiors without hypocrisy or servility, even when his private character was entitled to little esteem. At the same time, the ideal thus presented must on good natures have an elevating effect, must tend to raise them above the vulgar abuses of wealth, and to make them regard as the greatest advantage it conferred the power of more largely and effectually benefiting their fellow-men. Our ideas of the office of the workman must also be transformed and elevated. The way in which his position was habitually contemplated by the economists, and, indeed, by the public, was a very narrow, and therefore a false one. Labour was spoken of as if it were an independent entity, separable from the personality of the workman, or it was treated as a commodity, like corn or cotton. By viewing labour as a commodity, we at once got rid of the moral basis on which the relation of employer and employed should stand, and make the so-called law of the market the sole regulator of that relation. The entire case received a different complexion when we placed ourselves at the social point of view, from which alone these subjects could be rightly studied. Labour, in the widest sense of the word, was then seen to be the continuous and combined effort of our race for the improvement of its condition and its nature, the present using the acquired knowledge and transmitted resources of the past, and handing down an augmented inheritance to the future. This was the only really human conception of labour, the only one which put employer and employed each in his right place. It would place on a solid basis the claim of the working-man to the respect and courtesy on the part of his superiors in rank; it would profoundly modify our way of viewing his remuneration. His faithful services was now too often regarded as obtaining in his wages a full equivalent return. The wages of the workingman ought to be regarded as the indispensable means of keeping him in such a state of physical health, material security, and moral quietude that he might be able to continue his service to society and to prepare a new generation for the same service. The only true recompense of the right performance of his functions lay in the conscious fulfilment of social duty and in the approbation and esteem which he justly earned from such of his fellow men as had the opportunity and the capacity for appreciating his work. The twofold conception he had presented of the capitalist and the workman brought out distinctly their duties to each other. These obligations were binding on both sides,—on the part of the workman for faithful work, as opposed to eye service, and for abstinence from all unreasonable demands; in the master, as the higher and more powerful of the associates, they involved a larger responsibility and duties of a wider range. As the appropriate motto of the feudal ages was *noblesse oblige*, so that of modern industrial society must be *richesse oblige*. The masters must subdue in themselves the base inclinations which prompted too many, while accumulating personal gain and lavishing it on their own pleasures and ostentations, to neglect their co-workers, who ought to share in equitable measure the benefits arising from their joint operations. The masters ought to be, as some of them had nobly shown themselves, the friends of their workmen, interested in their welfare and that of their families, and actively studying that welfare, in which he said he assumed the continued existence of the separation between the capitalist and the workmen. As to the so-called co-operative system, it had not yet received much cordial approbation from the working man. The co-operative stores or societies of supply were genuine efforts of the people to escape from the abuses of the retail traffic, in order to obtain good articles at reasonable prices. These had been really successful, and had done much good; but they were not true co-operative societies,—they were joint-stock companies. But the co-operative societies of production had far more widely-reaching objects, at least in the conceptions of the social speculators who had most strongly advocated them. To these they presented themselves as the true solution of the labour problem. Professor Cairnes believed that in this new organisation of industry lay the one hope of the working classes, and Mr. Thornton preached it as a panacea for the evils of the world of labour. He ought to speak with caution and modesty in opposition to such men, but he was compelled to say that in his opinion the proposed solution was an impracticable one, and that the material and moral results of any attempt to realise it on a large scale would disappoint the expectations that had been entertained respecting it. Our recent policy had been to give the security of the State for the deposits of the savings of the working classes,—a policy founded on the just idea that for them, not gain, but the prevention of loss, was the first object. The natural destination of such savings was not industrial investment, but the formation of a modest reserve to meet special domestic exigencies, or to make possible the performance of special domestic duties. It was said that the co-operative system would enable workmen to understand the difficulties of the capitalist, and so be more reasonable in their demands; but Dr. Ingram thought the lesson would be dearly bought by repeated failures, and that the same lesson could be sufficiently inculcated by observation and study. He combated the idea that the co-operative system would draw out the best qualities of the working man, and had no faith in moral regeneration founded on motives of self-interest. He thought that on the whole the effect would be to spoil the best qualities of the working-man. His large sympathies and generous impulses would

be supplanted by comparative deadness to social interests; the enjoyment of domestic life and the cultivation of the intellect would be subordinated to the pursuit of profit; and he would be likely to prolong the hours of labour on the plea that he was working for himself. He believed that the immense majority of working-men must remain to the end working-men, and that only. He further believed that this necessity admitted of being fully reconciled with their happiness and their dignity. What they ought to aim at was the elevation of their class as such without seeking to alter the basis of the existing organisation of industry. In this work they would find not only an abundant but a fruitful field for all their public spirit, energy, and sagacity. It seemed to him the merit of the trade-union movement was that it followed precisely the practical and hopeful line he had indicated. Attacked and denounced as scarcely any other institution had been, the unions had thriven and grown in the face of opposition. This healthy vitality had been due to the fact that they were a general product of social needs, indispensable as a protest and a struggle against the abuses of industrial government and inevitable as a consequence of that consciousness of strength inspired by the concentration of numbers. Under the new conditions of industry they had purged themselves from abuses which were explained, if not palliated, by the injustice of the law from which they had now liberated themselves by steady, moderate, and well-considered action. They had been instruments of progress; they had infused into the working-man a new spirit of independence and self-respect. The testimony of all who had the best means of knowing was that instead of multiplying strikes they had diminished their frequency and mitigated their violence. They should proceed further in the same path. If there were anything remaining in their rules which could not be defended on principles of the highest social morality, they ought to expunge it. They should put forward no claims that were not rigorously just. They should seek to give effect to these claims by conciliatory methods, regarding strikes as a last resource,—sometimes, indeed, necessary, but always deplorable, as intensifying evil passions and compromising many innocent existences. They should discuss all the questions that concerned them, such as those of wages, hours of labour, piecework, apprenticeship, on higher grounds than those of material class interests; they should invite the attention of the thinking public to these questions, and look to the best disinterested opinion as the judge and controller of their operations. What were the objects which the working-class ought to keep before them? First, adequate wages. It was stated that the working-class must submit to a reduction of wages in order that the capitalist might undersell the foreign competitor, and then wages would rise. The same appeal was made in Continental countries to defeat British capitalists. To judge by the language used by capitalists and their spokesmen, it might seem that the great question of industrial life at the present time was this,—what working population among civilised nations would be content to live the most miserably, in order to drive the others out of the markets of the world? He hoped the working classes would follow no such *ignis fatuus*. What was really to be desired was that the foreign working-man's standard of living might rise, and that he might maintain every increase of the wages which he had once secured. That would doubly promote the interests of our working-men, for the foreign working-man would then be a better customer for English products generally, and be less likely to be transferred from his own country to England for the purpose of reducing their wages. He thought that if any foreign country had peculiar facilities for any form of production it was desirable that they should be brought into effective operation. If each nation withdrew from those branches of industry for which its native bent or its circumstances disqualified it, choosing those for which it had special advantage, the common harmony would be greatly promoted, while the general wealth would be augmented. It was one of the greatest evils of the protective system that it stood in the way of such adjustments. The second want of the workman was a well-regulated house. Dr. Ingram advocated the cultivation of the domestic affections and duties. The wife, he observed, was the centre of the home, and in order to enable her to discharge her sacred duties she ought to be freed from the necessity of non-domestic labour, which was now too often imposed upon her. He commended the efforts of those who were endeavouring to improve the dwellings of the working-classes. The third requirement of the working-classes was educated. He dwelt at some length upon the importance of this object, and in conclusion observed that the truly vital interest of the working-men was that the whole class should rise in material comfort and security, and still more in intellectual and moral attainments.

A SIGNBOARD AND A QUESTION.

THE newspapers have given particulars of a singular dispute touching the ownership of the signboard of the Royal Oak Hotel, Bettws-y-Coed, submitted for the decision of the Bangor District Court of Bankruptcy. The sign, which is well known to most tourists in Wales, was painted by David Cox in 1847 as the signboard of the hotel. David Cox re-touched it in 1849, and in 1861, at the request of many admirers of the artist, it was placed in the hall of the hotel. The late landlady having gone into liquidation, the trustees claimed to include in the effects the old signboard, for which it was stated a connoisseur had offered 1,000*l.*, and a dispute now arose whether the painting was not a fixture, and as such belonged to the lessor, Lady Willoughby D'Eresby. The judge, after a perusal of the voluminous affidavits, decided in favour of her ladyship, directing that the costs of the application should be paid out of the debtor's estate. To make us agree in the decision as to this old sign, we ought to hear that no other signboard had been put up in its place outside.

The incident reminds us of Sir Edwin Landseer's old shutter. Mr. Jacob Bell had done some friendly commission, as on many other occasions, for the artist, and the latter desired to give him something. Bell would have nothing, but ultimately said, "Well, give me the old shutter in the stable window," a rough panel on which Landseer had partly painted a picture. For this, as he told us himself, he was afterwards offered 600*l.*

PROJECTED LOCAL BOARD OFFICES FOR SOUTH HORNSEY.

ALREADY the necessary documents in connexion with the purchase of the freehold of the site whereon stood Milton-road Chapel, South Hornsey, have been signed, and plans have been prepared for the Local Board Offices which are to be erected there. The total frontage of the land is 119 ft., and the depth, 96 ft., and this has been signed over to the Chairman of the Board (Mr. G. C. Boor) for 1,600*l.*

Mr. Fry, the Local Board surveyor, has prepared plans for the erection of a stone building, to include clerk's, surveyor's, inspector of nuisances', and other offices, Board-room, and all necessary conveniences, whilst in the yard at the rear is to be erected a mortuary with *post-mortem* room (distinct from other buildings), which is intended, in general details, to be as near an approach to the Parisian Morgue as possible. Other erections on the site will include surveyor's residence, foreman's cottage, fire-engine station, cart-sheds, tool-houses, stables, and other essentials to the work of the Board. The principal building will have a frontage of 46 ft., and an elevation of 34 ft. The Board-room will be 43 ft. 6 in. long, and 23 ft. 10 in. wide, the elevation from floor to ceiling being 16 ft. An ante-room for the convenience of committees, deputations, judicial inquiries, inquests, &c., is also to be provided, with separate lavatories for officials and the public. The surveyor's residence will be of brick, with stone dressings, as also will the fire-engine station. The heating of the building will be carried out by means of hot-water pipes to be laid beneath the basement floor, but beyond this there will be no underground operations whatever.

A special committee of the Board appointed to inspect the plans and make the necessary inquiries and arrangements, reported that they had seen similar erections to those under notice which had cost 7,966*l.* Mr. Fry submitted his plans as described, and estimated their entire carrying out at an outlay of 6,643*l.*

The Board unanimously adopted the plans, and agreed to at once apply for powers for the borrowing of 7,500*l.*, which latter sum was thought to be advisable in view of any contingencies.

CHURCH OF ST. NICOLAS, ABINGDON.

FOR many years past the restoration and repair of the parish church of St. Nicolas has been contemplated. A report as to its condition was made as far back as 1867, and the works are now to be commenced in earnest, under the direction of, and from drawings prepared by, the architect and sanctioned by the Bishop's Court this year. A new one will be placed in the nave, and the church will be newly benched with oak.

The freestone work, externally, will be of Doulting, and, internally, of Corsham stone. The church is said to have been built by an abbot of the abbey, Nicolas de Coleham, between the years 1289 and 1307. Mr. Edwin Dolby, of Abingdon, is the architect, and Mr. Edward Williams, of the same town, the builder.

PERTH MUNICIPAL BUILDINGS.

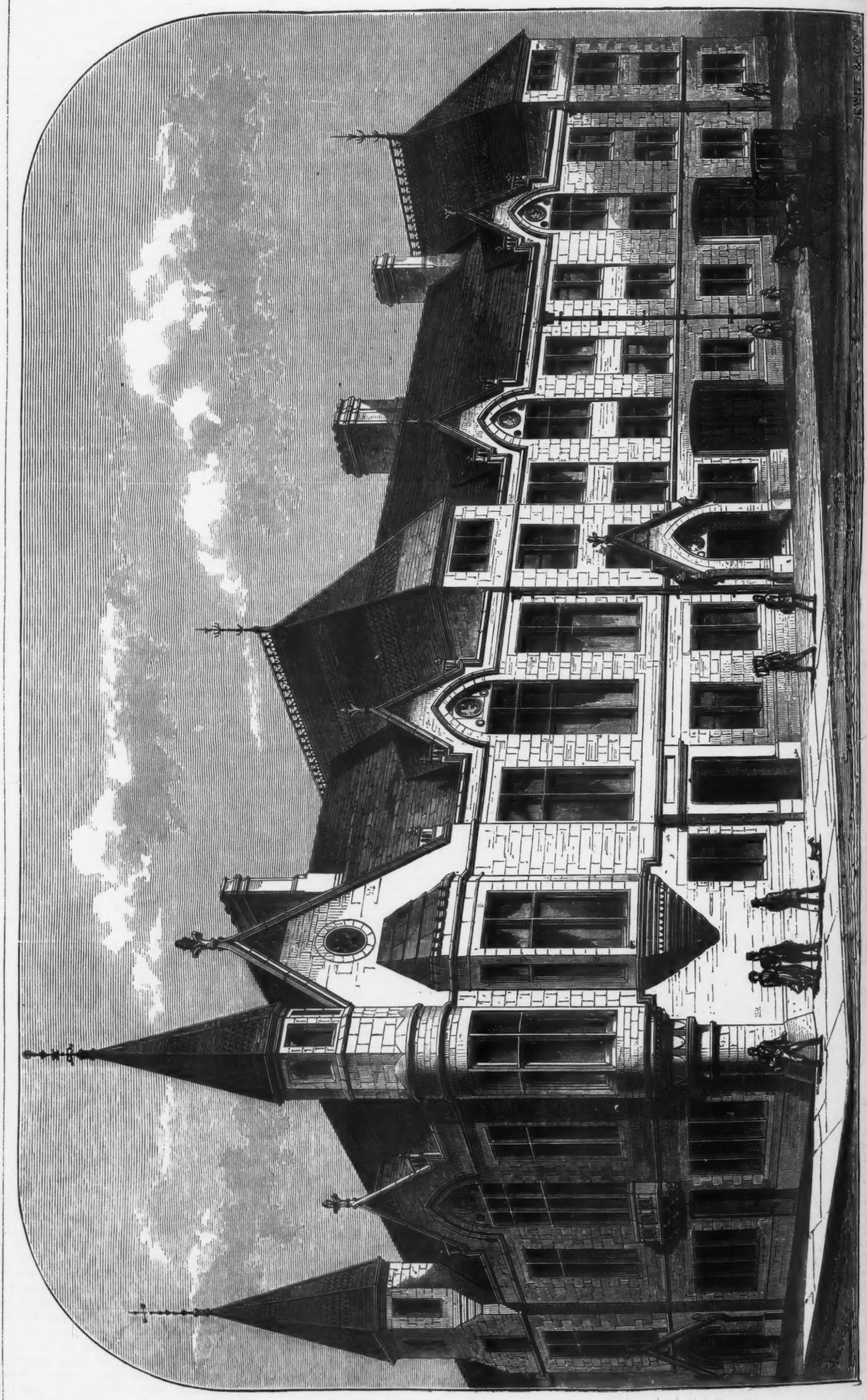
As the people of Glasgow are preparing to erect Municipal Buildings in their city, it may be specially interesting to know what is being done in that way at this time in other parts of Scotland.

The new buildings for Perth occupy the site of the old Council-chambers, and the adjoining property recently acquired by the Police Commissioners, and has frontages to Tay and High streets. The main entrance is from the High-street. On the ground-floor there is the city chamberlain's office, 25 ft. by 23 ft.; registrar's office, 19 ft. by 15 ft. The police office fronts Tay-street, and is 30 ft. by 22 ft.; superintendent's rooms, 16 ft. by 13 ft. Behind the police-office there are two ranges of cells, four on each side, entered from a large corridor, and shut out from the main office by an iron gate. Apartments are provided for the mustering of the policemen, and for a fire-engine house. The council-chamber is situated on the first floor, its dimensions are 41 ft. by 25 ft. The burgh court-room, 30 ft. by 22 ft., is on the same floor, having a public entrance from Tay-street, and a private entrance from the council-chamber, adjoining which there is a committee-room, 24 ft. by 21 ft.; and a waiting-room, 17 ft. by 13 ft. Offices are also provided for the treasurer to the Police Commissioners, and for the burgh assessor. A house for the superintendent of police occupies the second floor.

The elevations are faced with freestone from Bonfield Quarry, Fifeshire; the internal stonework has been taken from the local Huntingtower quarries. The ceilings of the council-chamber and burgh court-room are of pitch pine, and the panels are decorated with quaint stencil designs in colour. The finishings for doors, windows, and panelling on walls, &c., are of yellow pine. The main entrance doors and furniture are of oak. The council-table around which the councillors sit is horse-shoe shaped to facilitate communication with the councillors from the city clerk's desk, which is placed near the magistrates' bench.

The cost of the buildings is about 11,000*l.* Messrs. A. & A. Heiton, of Perth, are the architects; and Mr. Wells, burgh surveyor, is the inspector of works.

Lock-out in Paris.—One hundred and thirty cabinetmakers of the Faubourg St. Antoine locked their workmen out on Monday night. According to the *Standard*, this step was decided upon at a meeting of masters on Saturday, in consequence of the hostile action of their workmen. These have, it appears, been for some time in the habit of forming partial strikes by proscribing certain employers, for whom they refused to work, except on conditions settled by an executive committee. The houses in question have now agreed to close their workshops until the proscription has been withdrawn, but have appointed a committee to meet a deputation of the men for the discussion and arrangement of matters. The workmen met, and resolved to exact wages at the rate of 80 centimes per hour, and not to work more than ten hours a day. Two thousand men are thrown out of employment.

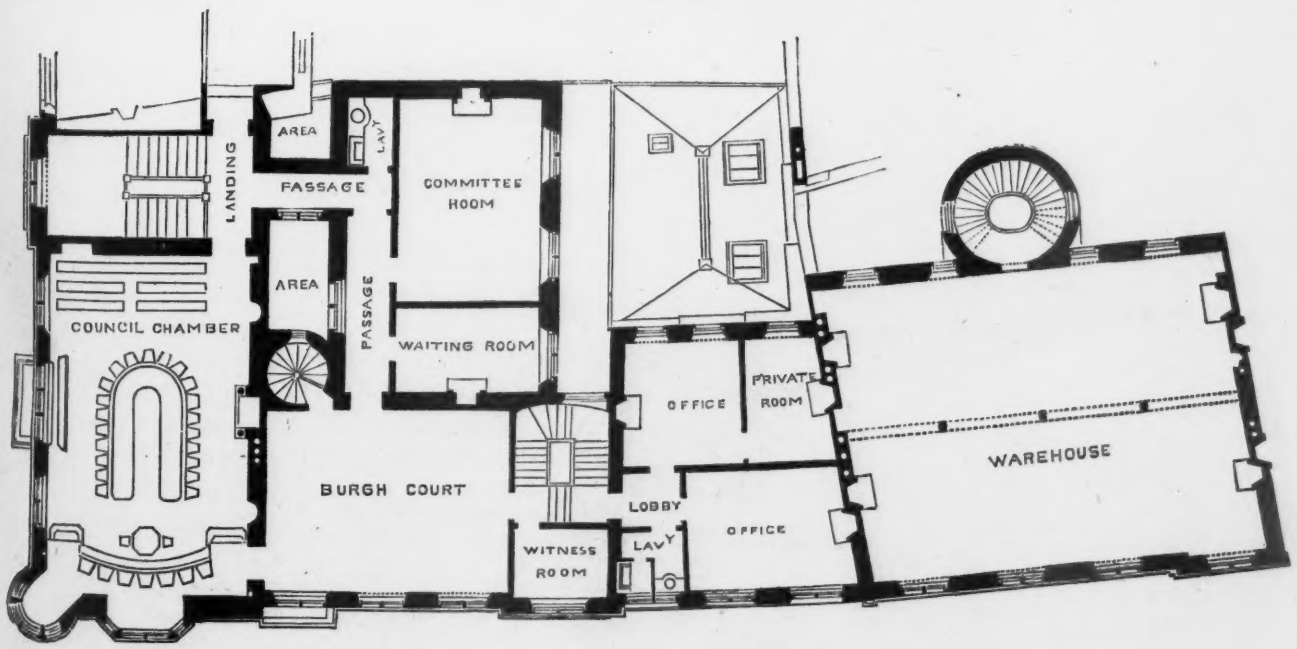


NEW MUNICIPAL BUILDINGS, PERTH.—Messrs. A. & A. Heiton, Architects.

JOKES IN STONE: MODERN CORBELS, FROM CHESTER CATHEDRAL.

POLITICAL CONTENTION.

RELIGIOUS CONTENTION.



NEW MUNICIPAL BUILDINGS, PERTH.

Whiteman & Bass *Photo-Litho* 236 High Holborn

THE NEW NATIONAL MUSEUM, WASHINGTON, UNITED ST

UNITED STATES.——Messrs. Cluss & Schulze, Architects.

Wyman & Sons, Printers, 6 Queen St.

THE NEW NATIONAL MUSEUM, WASHINGTON, UNITED STATES.

A LARGE quantity of valuable material for the development of the resources of the nation, much of which was given by foreign Governments to the United States, and from the exhibit of the United States on the occasion of its Centennial International Exhibition, lying dormant and inaccessible to the public, an appropriation of $250,000 was made by Congress, on March 4, 1879, for the erection of a fire-proof building for the National Museum, on the public grounds near the building of the Smithsonian Institution. The funds were to be expended under the control of the Board of Regents of the Smithsonian. The Regents created a building commission, of which General Wm. T. Sherman, Dr. Parker, and Prof. S. F. Baird are the members. On invitation of this Board, Major-General M. C. Meigs consented to act as consulting engineer. On March 25th following, the Commission placed the construction of the building in charge of Messrs. Cluss & Schulze, architects, whose designs had been adopted. They prepared at once plans, working drawings, schedules, specifications, and advertisements for materials of all kinds required, and, for labour in the different branches of the work, took advantage of the low prices then prevailing, and proceeded to finish the building within the limit of the moderate amount placed at their disposal.

For a description of the building we are indebted to the architects.

The building starts on the ground in the form of a square with sides of 327 ft. extreme length. This is surmounted by a cross and a dome. Within its facades, a net area of 102,200 square feet, or $2\frac{35}{100}$ acres is covered by roofs. It contains underground the boiler-room and pipes of a steam-heating apparatus, a coal-cellar, and two large cellars for storage purposes. From one of these cellars a subterranean communication with the adjacent Smithsonian building is established, which besides ordinary uses, will serve in cases of panic, fire, or tumult.

On the main floor there are available, in seventeen halls, which freely communicate with one another by wide and lofty archways, 80,300 square feet of floor-space, and a proportionate amount of wall-space for exhibition purposes. Further, there are available on the main floor and two upper stories of four corner pavilions and eight towers, 27,400 square feet of floor-space, divided off into 135 rooms for administrative purposes, offices, working rooms, photographer, the necessary modern accommodations, &c. And, finally, about 4,000 square feet of floor-space on galleries which are intended in part for special exhibits, and in part to afford an unobstructed view of the *ensemble* of the exhibits.

On the whole, the one-story plan which has prevailed among experts ever since the Paris Exhibition of 1867, has been adopted. But by the introduction of upper stories in ornamental pavilions and towers, ample office room has been secured without encroaching materially upon the floor-space of the main halls.

The centre of the building is octagonal on the ground-floor, and is surmounted by a 16-sided polygon of 67 ft. diameter, which contains a tier of large windows, and constitutes a dome-like structure with a slate roof and a lantern, crowned by a decorated finial. This dome is 77 ft. high on the side walls, or 108 ft. to the top of the finials. Four naves of 65 ft. in width, and 117 ft. in length, radiate from the dome, and extend to the outside walls of the building; these naves form a Greek cross, over the centre of which the dome rises, and part of the spaces between the arms of the cross is fitted up with halls of 65 ft. square, and of the same height as the naves, the side-walls of both being 42 ft. high, while the height to the ridges of the slate roofs is 56 ft. These roofs are in part constructed double, for the purpose of so perfecting the drainage of the roofs that accumulations of ice and snow can nowhere obstruct it. The spaces between the high walls of and around the Greek cross on one side, and the exterior walls of the building on the other side, are allotted mainly to eight halls of reduced height, covered by lean-to metal roofs, the extreme height of which is 32 ft. By this treatment wall-spaces are obtained for the introduction of clearstory windows, which light the square halls, and assist in lighting the naves.

The four symmetrical exterior walls of the building are broken by projections in the centre and at the corners, and these have been amply utilised for miscellaneous administrative purposes, as stated above.

A modernised Romanesque style of architecture was adopted for the new building, in order to keep a relationship with the adjacent Smithsonian building, which is designed in Norman, a variety of this style. It was found necessary to modernise the style on account of the different building materials used, brick in place of red sandstone, and to do justice to the modern demands for elegance of construction, the greatest possible available floor-space, easy communications, efficient drainage, a well calculated and pleasing admission of light, free circulation of air, and other hygienic requirements.

The external architecture is based upon the general arrangement of the interior; it shows plainly the prominence of the four naves, and the careful management of the light for the central portion of the building. Four main entrances are in the centres of the façades between two lofty towers of 86 ft. in height; these act as buttresses for the naves. Between the towers, above and receding from the doorways, there are large arched windows filled with ornamented glass, and above these the gables of the naves are formed; they contain inscription plates, and are crowned with allegorical groups of statuary. The group over the northern gable, designed by C. Buberl, of New York, introduces Columbia as the protectress of science and industry. The second group, by the same artist, represents Peace with the fine arts.

To both sides of these prominent central features there are curtain walls, 27 ft. in height, which have the effect of arcades. Pavilions are placed at the corners; they are of less height than the towers, but sufficiently raised above the curtain walls to overcome the unfavourable effect which these comparatively low walls would otherwise produce.

In the rear of the curtain walls, the clearstory rises to the full height of the naves, the roofs of which terminate against the side walls of the dome. The dome is treated in a similar way, and strictly in the same character as the curtain walls above alluded to.

In addition to the windows in the solid masonry of the exterior walls, clearstory, and dome, lofty lanterns have been provided above the centres of the naves and square halls, so as to afford perfect light for this enormous space without resorting to flat skylights, which for various reasons, were avoided. These lanterns, square and oblong, together with those of the related features of the pavilion, have been so arranged, in combination with towers, groups, clearstory, and the rising dome in the background, as to produce good skylines.

All the walls above ground are composed of brickwork, built hollow, with air spaces for outside wall. To neutralise the monotony and commonplace appearance which could not have been avoided with red-brick fronts of such extent, a sufficient number of buff bricks have been introduced in panels and spandrels, interspersed with a small number of blue bricks in the ornamental work of brick cornices. A base course of granite extends all around the building. The wrought work of the main entrances, window-sills, inscription plates, copings, &c., is grey Ohio freestone. The floor-beams, girders, and roofs are constructed of rolled and shaped iron. The floors are fireproofed by brick arches and concrete. Of roofs there are no fewer than thirty-seven, many of them of complicated construction. The lanterns on the ridges of the naves are large enough to cover moderate-sized dwellings. The light but solid framework of all the roofs will be left in full view, painted in light neutral tints.

The covering of the metal roofs is laid upon fireproofed gratings, suggested by Gen. M. C. Meigs.

The slates are hung to iron purlins. In order to facilitate the heating of this building, the sashes all through the edifice are glazed with double panes, having an intermediate air-space. In all windows facing the halls, the outer pane consists of obscured glass, in order to obtain a mellow light, and to avoid the necessity of shades.

The floors of the main hall will consist of concrete, but the rooms and smaller halls will, for convenience sake, be floored with Florida pine laid on concrete.

The interior is being plastered in sand finish, washed in tints.

The wide main entrance-doors, of walnut and oak, open outward on spacious tiled vestibules, with sides and arched ceilings of ornamented buff brickwork. These vestibules are closed after hours by wide double wrought-iron gates, richly ornamented, and finished in bronze and gold.

The northern entrance is intended for general use, and hence was made prominent. A spacious tiled platform, bounded by granite side blocks in front of this entrance, is approached by broad granite steps: these are flanked by stately candelabra.

In all their steps the architects were guided by the absolute necessity not to overrun the appropriation at disposal, and hence to produce the best effect with great economy, the exterior decoration was confined to the centres of the fronts, where the art of the sculptor has been called in.

The completion of this building, in which are enclosed 3,500,000 cubic feet of space above the cellars, required more than 5,500,000 bricks, 3,250 cubic yards of rubble-work and concrete, 500 tons of iron, 31,000 square feet of glass, and so forth.

CARICATURES IN STONE.

THERE was some sad nonsense talked in the House of Commons the other day, just before the prorogation, because it had been stated in a newspaper that the corbels of one of the windows at the New Law Courts were being made to represent, one the architect of the building, and the other the "obscure" contractor. What motive the member had who raised the objection, and who must have known that such freaks were matters of every-day occurrence, it is difficult to imagine. The incident has reminded us of some grotesque modern carvings which a friend of ours lighted upon lately at Chester Cathedral, and of which we give engravings, for the amusement of our readers. These corbels will be found on the north-east corner of the north transept of the cathedral, and seem to be known locally as Political Contention and Religious Contention. In the first, Lord Beaconsfield and the late Dr. Kenealy are readily recognisable engaged in a struggle, in which a crown and a cap of liberty are concerned; and in the second Mr. Gladstone, whose likeness is better in the original than in our presentment, is using his learning as a fulcrum for the upsetting of the Romish Church.

We leave our readers, however, to exercise their ingenuity in discovering exactly what the lithic caricaturist desired to convey in these freaks of the chisel.

SANITARY REFORM IN THIS COUNTRY.

THE Exeter Congress of the Sanitary Institute was opened on Tuesday evening last with an address by Earl Fortescue, as president. It purported to give a history, from the writer's own point of view, of all the legislative measures which have followed the first movements on the subject, and was necessarily, therefore, very long. He objected strongly to the doings of the Metropolitan Board of Works, and to the course pursued by the present Government in respect of the Water Companies. We give the concluding paragraphs of the address:—

We have had eloquent declamation enough about the horrors of war. Still, along with the terrible amount of suffering and crime incident to it, no one can deny that war also calls forth in the nobler natures engaged in it some of the finest qualities of man,—patriotism, courage, endurance, self-denial, self-sacrifice,—not to speak of the lofty Christian heroism of men like Havelock. If peace has its victories no less than war, peace has its victims far more numerous than war. For instance, the needless waste of life in the United Kingdom during the Crimean War, was many times greater than the loss of life in the Crimean War,—a waste accompanied by the long train of physical, intellectual, moral, and spiritual evils involved in general degradation. For all experience shows that, as a rule, dirt, disease, and vice are concurrent; that with rare exceptions, families cannot lodge like pigs and live like Christians.

With regard to fresh legislation, the first Sanitary Consolidated Act of 1875 seems to embody most, though not quite all, that is wanted. The principle of distributing the cost of works, and especially of the smaller kind, over a series of years by the Improvement Rate, first sanctioned in the Metropolitan Sewers Act, 1848, has been far too little encouraged or adopted. It may seem rather complicated at first,

but we found by the aid of tables that it was easily worked, and it practically averted, to a great extent, difficult and intricate questions of ownership as regarded chargeability for such works, since the occupiers were generally satisfied that they received benefits from them worth the extra rate to be paid for them. The principle, also, of engaging an officer's whole time for the public service, and employing it in any public duties not practically incompatible, seems worthy of much more extensive adoption, not only because of the great saving in trouble and correspondence to which it conduces when co-operation between different authorities of any kind is required, but also because it removes the temptations to sacrifice public duty when it conflicts with private interest, which must sometimes arise in the case of a public officer having also private practice. Only the boundaries of unions,—which must, now that the parish has been almost wholly superseded in that respect, be regarded as the unit of local administration in England,—are in so many cases incongruous with those of the counties as to present great, though I hope not insurmountable, difficulties in the way of what I have long wished for,—the establishment of representative county boards as general intermediate authorities between the union and Downing-street. Administration is now much more in default than legislation. As the Sanitary Commission say in their Report:—

"The system of self-government, of which the English nation is so justly proud, can hardly be applied with success to any subject, unless the governing bodies comprise a fair proportion of enlightened and well-informed minds; and if this be true as a general proposition, it is especially true in regard to matters affecting public health.

In the next place, many sanitary questions of vital importance are, from their very nature, incapable of being completely provided for by any amount of legal enactment, however minute and explicit. So large a discretion must of necessity be left to local authorities as to details, that in practice much will always depend on the energy and wisdom of those who compose such authorities. Moreover, there are limits to the power of any central authority to remedy the evils produced by local inefficiency. It may control, stimulate, and in some cases supplement the efforts of local bodies, but it cannot be a substitute for them."

This has been practically recognised by the Legislature, and as Dr. Acland truly observes in his recent address:—

"On the education and voluntary action of the people depends now, before all things, their sanitary condition. They have the means of obtaining knowledge; they have the means of obtaining power. If they have the will they can obtain both. There are good books now and to spare on every branch of the question,—legal, engineering, chemical, medical, &c."

I further agree with him when he says:—

"Compulsory powers should only be exercised by the central authority in the most extreme cases, and this should be clearly understood to be the principle of action; but, as a corollary, the central authority should with the utmost freedom collect the best information, and disseminate it in the freest way. If the Treasury should not sanction the gift of reports, every local official should receive notice of all Government health publications, with the statement of the contents, cost, and where to obtain them, immediately on their issue. This would promote progress of education—and would, quite certainly, be done, and is the least that would be done, *mutatis mutandis*, by any large private company dealing with the subject. It is being done to some extent by the model bye-laws recently issued, but should be done much more extensively."

This constant diffusion of sound principles and of practical information by the wide distribution of these official reports, as well as by their general circulars and separate letters to the unions, was largely practised by the early Poor Law Commissioners. But I found, when I became secretary to the Poor Law Board, that very little more than the mere necessary formal sanctions and orders had been for some time issued from the office. The same remark applies to the change of policy in sanitary matters ever since the suppression of the first General Board of Health.

When the Treasury were stopping the former wide circulation of Reports, &c., on the plea of expense, I hardly ever recollect any member of any Government throwing any impediment in the way of the granting and printing masses of useless papers moved for in either House, however useless he knew printing them to be. The mere adoption of the system of printing large numbers long adopted by the Statistical Society of omitting the hundreds of thousands in all cases of tables of figures where minute accuracy is not required (and to how vast a proportion of them does this not apply?), would have saved over and over again the cost of continuing freely to diffuse information tending the wealth and weal, because the health, of the community. It was economising the means of economy. *Magnum vectigal parsimonia.* But refusing the useful expenditure pleased many of the same class of members that refusing the useless expenditure would have offended.

Ministers may declaim grandly about sanitation, yet we have always found honours and encouragements markedly withheld from every sanitary reformer,—*laudatur et alget.* The Local Government Board has for some time had the double charge of supervising the poor relief and the sanitary administration of the country. I am sure I am not at all disparaging the valuable public services rendered by my friend Sir J. Lambert, when I compare his in both departments with those of my valued and honoured old friend Mr. Chadwick, who took the chief part in preparing the great Poor Law Reform Act of 1834, as well as the convincing and exhaustive Report of the Commission of Inquiry, which paved the way for it; and who, after years of able and energetic work as secretary to the Poor Law Commissioners under that Act, equally prepared the way, by his masterly Sanitary Report of 1842, for the Public Health Act of 1848, and afterwards, as member of the General Board of Health under that Act, rendered such valuable services (nowhere so little appreciated as in his own country) to the cause of sanitary reform throughout the world. Not only have foreign sovereigns recognised this on various occasions, but the illustrious Institute of France years ago paid him the rare compliment of electing him into their body. Yet, while Sir J. Lambert has deservedly been made a Knight Commander, his far greater predecessor is only a Commander, of the Bath. To take another striking example, Mr. Rawlinson, sanitary engineer to the same department, of whom I have already spoken, received the same honour as Mr. Chadwick; but it was for sanitary science rendered to the army before Sebastopol, where he was under fire, not in acknowledgment of his successful work at home. Sir J. Bazalgette has also received the same distinction, and was knighted, if I am not mistaken, on the completion of his largest and most costly failure. I must add one more signal instance of official neglect,—the name of Dr. Farr, known and honoured by every zealous statesman and sanitary reformer throughout the civilised world.

As it seems clear that sanitary reform, though commended in general terms, has not received, nor is likely to enjoy, much official sympathy, and though praised in the abstract, is always liable to incur Parliamentary and municipal opposition in practice, we must endeavour, now that pretty sound legislation upon it has been obtained, to influence as far as possible public opinion on behalf not only of its principles, but its details, co-operating heartily with the many societies and associations, to say nothing of the many private individuals who have done so much to elucidate and stimulate an interest in the subject under its various aspects. We must try to enlist general administrative action in conformity with them; and in this term I would comprehend all administrative bodies, from the Cabinet down to the school managers of the country parish: and not administrative action alone, but family action and personal action, and that not of the men only, but also,—I may almost say mainly,—of the women, and especially of the mothers. Not only is there nothing unfeminine in the action we ask of them, but it is pre-eminently in their own province, and essentially womanly.

And now let me commend to your sympathy and support a most valuable and unobtrusive Association, though enjoying the patronage of some of the highest in the land,—the Ladies' Sanitary Association, which has enlisted among its helpers and counsellors various able and benevolent men, and among them the scientific, eloquent, and genial President of this Institute, but has never quitted its own modest sphere of work for one more ambitious or conspicuous. It is ready to co-operate with all engaged in the good cause, but its particular object is to diffuse sanitary knowledge and promote sanitary reform, especially among the poor; and it tries to do this very much, among other ways, distributing plain little sanitary tracts among them; instituting mothers' meetings and classes of adult girls, and giving them sanitary and domestic instruction, and establishing nurseries for motherless babes, which may serve as schools for mothers of all classes, school-mistresses and nurses. It seeks to form branch associations. I trust that it will, before long, be able to count many.

I have trespassed already much too long on your attention. But I must remind you, in conclusion, that the cause of Sanitary Reform appeals not only to enlightened self-interest, but to our feelings of humanity and sense of religious duty. The law given by God to Moses comprised regulations recognised to this day as of great practical sanitary value, and our Divine Master and Great Example not only spake as never man spake, but showed His tender regard for the bodies as well as souls of men by going about doing good while upon earth, healing the sick, making the blind to see, and the lame to walk, and ministering to bodily wants and bodily suffering.*

EXHIBITION OF SANITARY APPLIANCES AT EXETER.

IN connexion with the Autumn Congress of the Sanitary Institute of Great Britain, which was commenced on Tuesday last in Exeter, an exhibition of sanitary apparatus and appliances was opened by the Mayor on Tuesday afternoon, amidst the ringing of church-bells, the playing of bands of music, and the display of unlimited bunting. It is to be hoped that the progress of the mayor in state through the city on such an errand will duly impress the citizens and those who have charge of the sanitary condition of the city with the importance of aiming at the attainment of the best possible hygienic conditions, for at the opening meeting of the Congress on Tuesday evening his worship admitted that the rate of mortality in the city was far greater than it ought to be. The exhibition is arranged in the new abattoirs on Exe Island,—buildings which, erected at a cost of about 4,000*l.*, appear to be admirably adapted for their special purpose, and capable of minimising as far as possible the offensiveness attaching to slaughter-houses. These abattoirs have not yet been opened for use, and so are much more salubrious than the streets and lanes immediately adjacent. Although, with the view of temporarily putting a better face upon things, the streets had been gravelled and planted with coniferæ and evergreens at intervals, those who had charge of these arrangements apparently forgot to use some of the deodorising agents so plentifully to be met with on the stalls of the exhibition. The exhibition itself is not so large and varied as the one held in Croydon last year, but the exhibits include many improvements and novelties. As might be expected in an exhibition held so far from London, several well-known firms are not represented in the collection, but, on the other hand, many West and South of England firms are exhibitors.

In *Class I., Construction and Machinery*, Messrs. Salmon, Barnes, & Co., of Ulverstone, exhibit (No. 1) their well-known revolving shutters in iron and wood. Messrs. Steele & Wood, of Stoke-on-Trent, show a collection of decorative tiles, with vitrified colours protected by glaze, in stoneware. Mr. Henry C. Webb, encaustic tile manufacturer, Worcester, displays specimens of wood, leather, marble, tiles, and other materials stained by a novel process. It is more especially applicable to wood, in which material the effect of inlaid work is produced. The peculiarity of the process is that the colours of the patterns (and there is practically no limit to the number of colours used in each design) go right through the wood or other material operated upon. Pitch-pine is the wood used by preference. The surfaces obtained by the process when polished have a very nice effect, and promise to afford a cheap and good substitute for parquetry and other work. The same process is applicable to the staining of paper, it being possible to stain fifty or sixty sheets at a time. Mr. Webb also exhibits specimens of a new method of inlaying by pressure hardwood or

* Some of the addresses delivered and papers read before the Sectional Meetings we will notice next week.

metal in soft wood. In Section 2 ("Paints and Protectives") of Class I., Messrs. Samuel Wills & Co., of Bristol, are the only exhibitors, their stall containing a variety of varnishes. In Sections 3 and 4 ("Wall Papers and Decorative Materials") Messrs. Wm. Woollams & Co., of London, have a good display of their non-arsenical wall-papers and dado-decorations. This firm, it will be remembered, was awarded the Medal of the Sanitary Institute for similar productions exhibited last year at the Croydon Exhibition. Messrs. Goff & Gully, of Exeter, exhibit specimens of "Linerusta-Walton," or "Linoleum Muralis," as it used more fitly to be called; so do Messrs. Cotterell Bros., decorators, of Bath and Bristol. Of the merits of this material we have often spoken. The last-named firm also make a good display of paperhangings, asserted to be non-arsenical; they are well designed, but whether they are the firm's own products is not stated. In Section 5 ("Machinery adapted for Sanitary Purposes") Mr. J. B. McCallum, the borough surveyor of Stafford, exhibits the "Excelsior" Pail or Tub-Van, designed for the conveyance of excreta in pails or tubs through towns without polluting the atmosphere and causing a nuisance. The van is non-absorbent, being of metal as far as possible. It is constructed with the view to prevent an accumulation of smells within, and the arising of noxious odour during the process of collection and passage through the streets. To gain this end ventilation is obtained through charcoal or other disinfecting ventilators. One important feature is the ample provision that is made for collecting any sloppings from the pails, thus preventing the same from finding its way into the streets. A collector is formed as a false bottom, which can be emptied by means of a screw-plug at the end of the journey. The weight of the van is apparently considerably less than that of the ordinary type. The van is made to contain twenty-four tubs; it will turn in its own length; and the openings, instead of being fitted with hinged doors, which are liable to be damaged by the wind and unnecessary wear and tear in opening carelessly, are fitted with doors sliding upward, which are made to remain open or shut at pleasure. Mr. McCallum also exhibits a revolving hand-sweeping brush and collector for road-scavenging, which is stated to have important advantages in point of economy. Messrs. Crossley Brothers, of Manchester, exhibit one of their "Otto" Silent Gas Engines at work. It is not surprising to learn that there is an increasing demand for this clean, easy-going, and economical motor-engine. Messrs. J. C. Stark & Co., of Torbay, exhibit a "Two-man" gas-engine,—a new patent; and Mr. J. E. H. Andrews, of Stockport, shows a "2-man" Bisschop gas-engine of new type. Among the exhibits in Class I., we noticed a plan for the disposal of the sewage of Exeter, involving the construction of new main sewers, and an outfall to conduct the sewage to proposed settling-tanks at Duck's Marshes, below Exeter, whence the effluent water is to pass into the tidal portion of the river Exe. The scheme has been prepared by Mr. H. Percy Boulnois, M.Inst. C.E., surveyor to the City of Exeter. Messrs. J. W. Trew & Sons, architects and surveyors, Bristol, exhibit designs for cottage hospitals and other buildings. Not included in the catalogue is a curious collection of sea-weed products from Paris, one of which, a flexible semi-transparent tissue resembling oil-skin, is capable of use (so it is claimed) for the remedying of damp walls.

In *Class II., Sewerage and Water Supply*,—Section 1 comprises water-closets. Mr. William White, F.S.A., of Wimpole-street, exhibits the "Shrewsbury" water-closet, invented and patented by him. It possesses the merits of cheapness and efficiency. Special and ingenious means are adopted to obtain a much more effectual flush-out of the pan than is attainable by the usual means. The water is discharged suddenly into the pan through a down-pipe at least 2 in. in diameter. Mr. White also exhibits his improved ball-valve and bib-cock. The makers of all these appliances are Messrs. F. Pierce & Co., of Little York-place, Baker-street. Mr. A. T. Angell, of Fulham-road, exhibits the patent self-ventilating "Disjuncta" closet, the principle of which is equally applicable to baths, sinks, &c. The space beneath the seat is so made as to prevent the passage of air through the joints of the woodwork to the interior of the house, but is ventilated direct into the open air by louvres made in the external wall. Inside this chamber or space the closet-basin is completely disconnected from the trap below, and it is claimed that all effluvium arising from the trap, and all sewer-gas that may be forced through it when the valve is opened by the upruah of air meeting the downflow of the contents of the closet or sink, will be carried outside through the louvres. A working model of the same closet is also exhibited by Dr. Churchill. Messrs. Capper, Son, & Co. exhibit Pearson's patent trapless "twin basin" closets. Mr. David Gill, of Weston-super-Mare, exhibits his "automatic action" water-closet, his patent flushing apparatus, and his "sanitary twin door." The closet is all in earthenware, and possesses the merit of being readily fixed, without breaking through or interfering at all with the floor surface. It is claimed for it that all effluvium caused while the closet is being used is carried away by a back draught at a point below the top of the basin. Underneath the pan is an outer air-chamber, with an air-passage to the front of the basin, and the air entering the closet-pan, while the latter is in use, passes over the contents of the receptacle, and through the exit air-pipe at the back. Ventilation of the closet-chamber itself is sought to be accomplished by means of air-boxes (one for ingress and one for egress, situate respectively at the bottom and top of the wall of the chamber), and these air-boxes are closed or opened by the raising or lowering of the closet-lid. When the closet-lid is up, the outer air is excluded, and the only ventilation is that through and across the closet-basin (supposing, that is, that the door is so made as to prevent the passage of air under or round its edges, for the inventor does not use the window for ventilation); but when the closet-lid is down, ventilation is going on through the room and through the closet pan as well, the inlets and outlets to each being separate, as already mentioned. For use in combination with these appliances, where it is specially desirable (as in hospitals) to take every possible precaution to cut off all passage of foul air from the water-closet to the interior of the building, Mr. Gill has devised twin doors, ventilating the space between them by special means. The whole arrangement, though perhaps theoretically perfect, is rather too elaborate and expensive for general use, but it is right to say that Mr. Gill advocates the use of double doors more as a means of securing privacy than as absolutely necessary on sanitary grounds. Messrs. Doulton & Co., of Lambeth, show their serviceable "Lambeth" valve closet and their improved side-outlet trapless closet, together with various closet-pans and other appliances in stoneware and earthenware. Messrs. Garton & King, of Exeter, exhibit Stidder's trapped "Universal" valve closet and wash-out closet and trap. Messrs. J. Tylor & Sons, of Newgate-street, show an excellent valve water-closet, and their patent "clearway" regulator valve closet, with parallel pull. They also exhibit seat-action closets and water-waste preventers. Mr. Bostel, of Brighton, again shows his "Excelsior" water-closet. Messrs. Brazier & Son, of Blackfriars-road, exhibit their "self-acting aromatic and deodorising water-closet," which has a chamber communicating with the water in the bottom of the pan and trap. This chamber is charged with lime and camphor, and every time the closet is used the water in the chamber is renewed, without, however, letting the lime or camphor escape. In Section 2 ("Dry Closets") the British Sanitary Company, of Glasgow, exhibit their patent self-acting earth-closet, which possesses some very good points, notably the non-liability of the earth to clog together in the hopper when not quite dry. Mr. James Woodhead, of Bradford, Mr. James Wood, of Newport, Mon., Mr. H. Phillips, of Exeter, Mr. John Parker, of Woodstock, and Messrs. Wippell, Bros., & Row, of Exeter, are exhibitors of dry closets and commodes of various kinds. In Section 3 ("Urinals") Messrs. Doulton & Co., and Messrs. Tylor & Sons are exhibitors; and Mr. Henry Phillips, of Exeter, shows a cheap urinal in connexion with a large receptacle for dry earth, so as to utilise the manurial properties of urine. Section 4 is devoted to sewage treatment, the exhibits under it including Spence's patent aluminoferric cake, Mr. William Batten's patent manhole covers and ventilators (previously noticed by us), and a model of a patent "sewer gas annihilator," exhibited by Mr. H. P. Boulnois, C.E., City Surveyor of Exeter. Some of those who saw this thought that it would merely prevent the sewer gas finding vent. Mr. Isaac Shone, of Wrexham, shows a number of large drawings and models illustrative of the application of his pneumatic sewerage system to the drainage of towns. Mr. J. A. Stephan, of Worcester, Messrs. Doulton & Co., and the Sanitary and Domestic Appliance Company, of Manchester, are exhibitors of filters. Messrs. Trew & Sons, of Bristol, exhibit working drawings of farm drainage works. In Section 5 ("Traps"), Mr. J. M. Craig, of Kilmarnock, exhibits two of Buchan's patent ventilating sewage-gas traps; and Messrs. Doulton & Co. have a collection of traps, open-air receivers, and gas interceptors,—all worth attention. Messrs. Candy & Co., of Newton Abbott, exhibit two full-sized models of their registered "perfect drain ventilator, which was awarded a bronze medal at the Royal (Cornwall) Polytechnic Society's meeting this year. Messrs. Brazier & Son, of Blackfriars-road, show their fat-interceptor and drain. In Section 6 ("Sinks") Messrs. Doulton & Co. exhibit slop, mortuary, and other sinks, and Messrs. Tylor & Sons their patent enamelled iron slop sink. In Section 8 ("Apparatus for Water Supply") Mr. Joseph Willoughby, of Plymouth, shows ball-taps which have a small plug formed within the main plug, to which a lever and float are attached. Messrs. Tylor & Sons display a large variety of "waste-not" and other valves, and Messrs. Doulton call attention to their high-pressure ball and draw-off valves. Mr. George T. Tonks, of Birmingham, exhibits Meakin's patent "frictionless balanced supply valve." The substitution of glass balls for those made of copper or zinc allows of the use of balls of a larger size than usual, while they are cheaper. In Section 9 ("Cisterns") Messrs. Doulton & Co. exhibit their water-waste preventing cisterns; and Mr. Thomas Davis, of Exeter, exhibits a cistern divided into two distinct compartments, the water in the one to be used only for flushing closets, and that in the other for drinking and culinary purposes. In Section 10 ("Flushing and Watering") Messrs. Bowes, Scott, & Read, of Westminster, exhibit Mr. Rogers Field's patent self-acting flushing tanks. Messrs. Doulton & Co. also have an automatic flush-tank, and they are large exhibitors in Section 11 ("Miscellaneous Sanitary Goods"). In the same section, Messrs. Henry Sharp, Jones, & Co., of the Bourne Valley Pottery, Poole, show their "Rock-Concrete" tubes for sewerage works, and Mr. John Phillips, of the Aller Pottery, Newton Abbot, and the Kinson Pottery, Poole, exhibits his patent "access pipe" for allowing of the ready examination of a drain. The arrangement consists of two pipes, butt-jointed as to the lower portions, and meeting on and supported by a "rest"; the upper portions of the pipes are cut into so as to leave a circular hole when placed together, and over this hole a saddleback cover is made to fit, supported by the "rest" already mentioned. At the same stand are also exhibited Phillips's patent vitrified stone-ware invert brick, terra-cotta chimney terminals and wind-guards, and specimens of Devonshire faience. The Branksea Island Pottery Company display a variety of stone-ware for sanitary purposes. Mr. W. Scammell, of Exeter, and Messrs. Candy & Co., of Newton Abbot, are exhibitors of the same class of goods. In this section Messrs. Tylor & Sons show their patent grooved joint, for fixing lead-pipe without solder.

Class III., Heating, Lighting, and Ventilation.—In Section 1 ("Heating Apparatus") of this class, Messrs. Chorlton & Dugdale, of Manchester, exhibit their "sunlight" stoves. Messrs. Doulton & Co. have a good display of their new "Lambeth Radiating Tile Stoves," in glazed fire-clay. They require little or no attention, and consume very little fuel. For halls, churches, school-rooms, &c., they are not only healthier, but, by reason of their colour, far more cheerful in appearance than iron stoves. Messrs. Garton & King, of Exeter, show Gillingham's patent heat radiator, and Mr. R. H. Griffin, of Kirby-street, Hatton-garden, exhibits eight of his patent ventilating and heating register-stoves. Mr. J. Williamson, also of Kirby-street, sends a number of stoves, hot-plates, &c.; and Mr. G. E. Pritchett, architect, exhibits examples of his cellular tile construction for warming walls and floors. In this section and in Section 2 ("Cooking Apparatus"). Messrs. Willey & Co., of Exeter, and other local firms, exhibit a large variety of gas-stoves for cooking and heating purposes, the Exeter Gas Company offering prizes for the best appliances shown,—among which we may mention Messrs. Verity's patent gas fires, and George's patent

Gas Calorigen, exhibited by B. Farwig & Co., of London. Mr. Constantine, of Fleet-street; the Wilson Engineering Company, London; and Messrs. H. C. Davis & Co., of Camberwell, are exhibitors of kitchen-ranges and other stoves. In Section 3 ("Lighting") there is a varied display of gasfittings by Stark & Co., Torquay; Webster & Co., Nottingham; and Willey & Co., Exeter. Section 4 is devoted to ventilating appliances, the exhibitors including Mr. Thomas Lloyd, of Winchester; Dr. Hinckes Bird (who exhibits his appliances for costless ventilation as described in the *Builder* in 1862); Mr. Josiah Moore, of Clerkenwell (Moore's louvre ventilators); Messrs. C. H. Sharp & Co., of Newgate-street (who show their "Crown Ejector" and other ventilators); and Messrs. C. Kite & Co., of London, exhibit their registered dormer ventilators for church roofs. The Sanitary and Economic Supply Association, Gloucester, exhibit Dr. Bond's patent "enthermic" ventilating gas stove; and Mr. Crispin, of Bristol, shows a lean-to greenhouse, ventilated on Hunt's patent auto-pneumatic system, which is worth attention. Messrs. Robert Boyle & Son, of Holborn Viaduct, send their long-tried and well-proved air-pump ventilators and other appliances.

Class IV., Personal Hygiene, Food, and Disinfectants,—is an interesting one, but we have not space to instance the numerous exhibits in the eight sections into which it is divided.

Class V., Miscellaneous,—includes thermometers, barometers, microscopes, and other scientific instruments likely to be of service to sanitarians and medical officers of health.

In opening the exhibition,

The Mayor (Alderman W. H. Ellis) said he felt sure that from the exhibition the citizens of Exeter would be able to get a great deal of valuable information. That was the first exhibition of the kind that had ever been held in Exeter, and he believed that it was one of the best that had ever been held anywhere. In it were to be found appliances of every kind, including drain-pipes, traps, ventilators, and cooking apparatus. Exceptionally might be mentioned the gas cooking apparatus. He was happy to say that the Gas Company of Exeter had been very liberal in offering medals for the best kinds of gas-cooking apparatus, the result being that they had there one of the best collections of gas apparatus ever brought together. He believed he was right in saying that they had over one hundred exhibits entered in this class. He trusted that it would be the means of encouraging a new mode of cooking in the future. The site on which this exhibition was being held was, to his mind, the best site that could have been possibly chosen. It was the site of the old Gas Works, and it had now been utilised by the Town Council for a public slaughter-house or abattoir. He trusted that as soon as the present exhibition was over the butchers of the city would see that it was to their advantage to come there to kill their animals. He hoped that whilst the exhibition remained open it would be visited by an immense concourse of people, who would be then able to gain valuable information to carry away to their homes, and so render Exeter and the neighbourhood one of the healthiest places in the world, and one of the most desirable places for people to reside in. He concluded by declaring the Exhibition open.

Earl Fortescue thought the best thanks of the Institute were due to the Mayor and inhabitants of Exeter for having provided them with that most admirable site for the exhibition of sanitary appliances. The thanks of the members of the Institute were also due to the Mayor and citizens for the cordial reception and kind hospitality which they had received at their hands.

Dr. Richardson heartily seconded the observations of Lord Fortescue. He thought the members of the Institute were most deeply indebted for the great care and kindness evinced on the part of the authorities of Exeter in forwarding this Exhibition, and he might say that practically no part of the work of the Sanitary Congress was of such importance to the country at large as this exhibition. For many days after the congress had closed the people for miles around Exeter would have an opportunity of visiting the exhibition; and if they learnt the practical lessons to be gathered from the exhibits, the exhibition was likely to be of more benefit than would arise from all the speeches and lectures in the congress. He knew of nothing so educational to the poor as an exhibition of that kind, and for that reason he most cordially seconded what had fallen from Lord Fortescue.

The exhibition, which is to remain open from ten a.m. to ten p.m. on every week-day until Saturday, October 9th, has not yet (so far as our observation has gone) been very largely attended. Mr. E. L. Box is the curator.

THE SOURCES OF OUR COAL SUPPLY.

DEPENDENT as is the position of the kingdom so largely on the reservoir of long-stored-up power which is contained in our coalfields, the extent to which the latter are drawn upon is a subject of great interest, and this the more because of fluctuation in the degree in which we draw upon the various sources of our coal supply. Railways have "set all the towns of Britain a-dancing," according to Carlyle; and they are changing very materially the extent to which we are dependent upon specific coalfields. In the official reports of the Inspectors of Mines we have reliable records of the extent to which our coalfields are drawn upon. In the kingdom we have coalfields stretched over nearly a twentieth part of its extent. In Scotland, the coalfields are chiefly between the shores of Fife and Haddington, and of Ayrshire. In England, the great coalfield of the north is early-famed; that of the midlands stretches over part of Yorkshire and the counties that adjoin it on the south; westward is that of Lancashire and Cheshire; and there are those of North and South Staffordshire; all these, with the rich seams of Wales, comprise the great bulk of the British coalfields. These coalfields, or the collieries therein, 3,356 in number, are under the inspection of fourteen inspectors. Each inspector reports to the Secretary of State yearly, his report embodying a statement of the amount of coal produced from the mines under his charge, the loss of life in the production of coal, and other similar particulars. The reports, therefore, contain official statements of the extent to which the respective districts contribute to the total fuel supply of the kingdom.

Taking last year as a typical one, it may be stated that 133,720,393 tons of coal were produced from the collieries in the kingdom. As the collieries vary in size,—the production varying at each from a few tons to nearly half a million tons a year,—it is evident that a citation of the numbers of pits in each district would be useless to indicate the proportionate production of each. And, though it would be less unsatisfactory, even the number of persons employed would be apt to mislead; for whilst in Ireland each person employed in and about the coal-fields gives back 100 tons of coal yearly, in Scotland the average output is over three times that quantity. The number of "persons" employed in and at the mines, it may be said, is 476,810,—three-fourths being employed under ground, whilst in the number employed above ground there are 4,842 females. Taking, then, the figures of exact production, these may be shortened by being placed in the decimal form, representing the millions of tons of coal produced in the districts. Each of the inspectors divides the output into that of the distinct counties; but whilst this is generally followed, in one or two instances the slight production of one part of a district is added to that of the chief portion. The following, then, are the quantities of coal produced by the districts or parts of districts named:—Cumberland, 1·525 million tons; North Durham, 6·105; Northumberland, 5·537; South Durham, 17·155; Lancashire, North and East, 8·993; Ireland, 0·129; Denbighshire, 1·499; West Lancashire, 9 562; and Flintshire, 0·721; Yorkshire, 16·241; Derbyshire, 7·561; Leicestershire, 1·103; Nottinghamshire, 4·316; Warwickshire, 1·054; Cheshire, 0·723; Shropshire, 0·822; North Staffordshire, 4·017; South Staffordshire, 7·806; Worcestershire, 1·522; Glamorgan (part), 0·746; Gloucestershire, 1·289; Monmouthshire, 4·660; Somersetshire, 0·742; Carmarthen, 0·664; Glamorganshire (part), 11·747; East Scotland, 11·300; West Scotland, 6·169. In these, with the exceptions of one or two very small contributions, the total is made up. In the working of the mines under the Coal Mines Act, there is also produced fire-clay, shale, &c., but the quantities are small, and are excluded from those above given.

These are the official figures, and it is evident that the great coalfield of the north-east of England still takes the lead in production, for it yields nearly 29,000,000 tons of coal, a quantity not very far short of one-fourth of the total brought to bank in Great Britain. The rich seams of South Wales are being increasingly drawn upon, and they now yield over 12,000,000 tons; but as it is estimated that that basin contains one-third of the available coal supply of the kingdom, and as the present output could be maintained for more than twenty-seven centuries, the increase of that output may be expected without alarm. From the coalfield of Lancashire over 18,000,000 tons are drawn yearly; from that of the Midlands, we extract in the counties of Yorkshire, Derbyshire, and Nottinghamshire more than 27,000,000 tons,—or, in proportion to the ascertained available coal, at least fourfold that hewn from South Wales; whilst the vast beds of North Staffordshire are drawn on to a comparatively slight degree. Those of Scotland preserve a steady output of 17,000,000 tons last year.

The reports of the inspectors furnish no information as to the uses of the coal; and the only facts that are obtainable as yet from other sources show that during last year more coal than usual was exported, and that more was sent to the metropolis. It is evident, then, that the consumption in the country generally had decreased, for the output of coal has been practically stationary for the last four years, whilst it had been previously advancing for a score of years at the average rate of 3,000,000 tons yearly. If the whole of the facts could be obtained, it would probably be found that a large part of the decrease is due to the intense dulness that has prevailed in the manufacturing and more especially in the smelting industries, which has been only partly counterbalanced by the growth in the consumption for gas-making purposes and for those of steam-raising. It is probable now that there has been a return of partial activity in the manufacturing trades, that the coal output of the kingdom will again resume its normal growth.

ART, HEALTH, AND ELECTRICITY.

THE recent heat, though so great in London, was far more intense in Paris, and the sufferings induced caused a renewed outcry in favour of electricity instead of gas. In public buildings, especially in theatres, the enormous number of gas-burners requisite to thoroughly illuminate these places is now, it is urged, an unnecessary evil. The electric light throws off little or no heat, it is unaccompanied by the bad odours inseparable from gas, and the danger of explosions or fire is avoided. Others urge that the injury to the public health caused by gas would also be removed, but are met by experts who say that the electric light produces a certain amount of nitrous oxide gas which is very poisonous. In spite of this, the advantage from a sanitary point of view is probably still in favour of the electric light. When noticing the electric modes of lighting exhibited at the last Universal Exhibition, we remarked on the benefits to the atmosphere of theatres, &c., that might result from the use of electricity, and we urged the importance of extensive experiments as to its sanitary advantage. Experiments must be instituted to settle this part of the question.

M. Charles Garnier loudly demands the introduction of electricity so as to preserve from destruction the works of art with which he has decorated the Paris Grand Opera. To descend from the sublime to the comic, from the Grand Opera to the Palais Royal, this latter theatre has been entirely re-decorated, and in so remarkable a manner that it merits a few words of notice. M. Bayard has been entrusted with the work, and has painted on the walls of the *foyer* or crush-room a biographical history of the theatre. On one side we have groups representing all the ancient actors in their most celebrated parts,—the Père Amant, Boutie, Déjazet, Julles Pernon, Nathalie, and Mars. To unite the past with the present there is an allegorical group of nymphs and satyrs, and then we find the portraits of all the celebrities who still convulse the gay audiences,—Brasseur, Hyacinthe, Ravel, Schneider, &c. But we are reminded that these new and elaborate decorations, which possess the double attraction of works of art and works of history, will be prematurely obliterated if they are exposed, night after night, to the blaze of innumerable gas-burners. The Gymnase Theatre has also been re-decorated, and these facts and the intense heat must account for the revival of the old contest relating to the respective merits of gas and electric light.

UNIVERSITY COLLEGE, LIVERPOOL.

THE establishment of the proposed University College at Liverpool will be an event of much more than mere local interest, for it may be fairly hoped that it will supply an educational want which exists in the populous county of Lancashire, even though Manchester has now for a good many years done much in the cause of higher education. The subscription list which has just been issued for the first time, is as remarkable a document as we have met with for a long time. Nothing can give a more vivid and practical sign of the immense wealth of this country, or of the greatest seaport of Great Britain. Nothing, too, shows more noticeably how flourishing is the position of our great mercantile towns, in spite of the depression of trade of which we have heard so much; for we find that there are no less than five donations of 10,000*l.* each, namely, that of Lord Derby, to found a chair of Natural History; of Mrs. Grant, to found one in some branch of science; of Messrs. W., S. G., & P. H. Rathbone, to endow a "King Alfred" chair of Modern History and Literature. Messrs. A. H. Brown, M.P., Crosfield, & Barrow, also give 10,000*l.* to found a chair of Ancient History and Literature; and there is another donation of a like amount to found a chair of Experimental Physics and Mathematics. We mention these gifts *seriatim*, because they seem to be of really historical interest as exemplifying the wealth of England in the nineteenth century. There are also many gifts towards a chair of Philosophy, Logic, and Political Economy, and to found a Roscoe Chair of Art, as a monument of the most durable kind to Mr. William Roscoe, the Italian historian, and the early patron of Gibson the sculptor. More than 6,000*l.* has already been collected for this object, which is one very worthy of support, for in no part of England is it more desirable to diffuse a love of art than in the somewhat hard and busy North country. And, we observe, to turn to the point of money again, in the whole list two gifts of 2,000*l.* each, and some sixteen of 1,000*l.* each, besides many of a large though lesser amount, all of which go to still further exemplify at once the wealth of Liverpool, and a spirit which by no means is unworthy of comparison with that which actuated the merchants of Venice, albeit the inhabitants of the great Mediæval seaport may have done more as a city for the direct and judicious encouragement of the fine arts.

CHRIST CHURCH, NEWGATE-STREET, CITY.

THIS fine church, one of those erected by Sir Christopher Wren after the Great Fire of London, is now being renovated and partially restored. The site it occupies, viz., reaching from Christ Church-passage eastwards to King Edward-street, is the site of about one-half of the original Grey Friars' Church, built in connexion with the monastery given by King Henry VIII. (the gift being confirmed by his son Edward VI.) to the citizens of London for a school, now the Blue Coat School.

This original Church of the Grey Friars was of great size, and occupied not only the site of the present Christ Church, but of the whole of the present churchyard opposite to it. It had a passage-way through it, almost in the centre, leading to the cloisters of the monastery situate northwards, a small portion of which cloisters still exist. This passage-way, now open to the sky, constitutes what is called Christ Church-passage.

Wren, of course, rebuilt the church in his favourite Classic style. It may be said to be remarkable for its fine, large, lofty, and airy nave, with large side-aisles, but has no chancel proper. The columns of the nave, with the clearstory windows carried by horizontal beams over them, reach, as it were, right up to the east wall. The absence of a duly-marked chancel was probably caused by the (to a certain extent) limited length of the site not allowing both nave and chancel of good proportion: hence Wren, preferring a good nave to a well-proportioned chancel with a stinted nave, designed a fine nave of good proportion, simply marking the chancel by two steps at the line of the second column from the east, and a raised floor up to the east wall.

The lofty stone columns (about 30 ft. high), formerly and of late all coloured over, have now been scraped and restored to the original stone, which is Portland; the clearstory window openings, from which the principal light to the church is derived, have been filled with new cathedral glass in lieu of the old lead lights; the vaulting, which is only of timber and plaster, has been all recoloured, with the ornamental portions picked out. The back portions of the heavy galleries have been removed, and the internal appearance of the church is thereby considerably improved. The pewing, which is of solid oak, has been all scraped, cleaned, and varnished.

It is in contemplation, should the Blue Coat School (the boys of which now fill the galleries every Sunday) be removed to the country, to take down the heavy galleries, and clear them entirely away; also to re-pew the church with pews of moderate height. This, it is thought, will much improve the interior, inasmuch as the galleries run across the lofty side-aisle windows, and were therefore erected by Wren for the purpose of obtaining a large number of seats, at that time wanted, but now no longer required, when City people reside in the suburbs.

The works have been carried out by Messrs. Hayward & Son, builders and decorators, under the supervision and direction of Mr. Henry S. Legg, of Christ's Hospital, the rector being the Rev. Michael Gibbs, M.A.

The Lord Mayor and sheriffs attended service at the church on Sunday, the first day of opening after the completion of the works, it being customary for the Lord Mayor to attend in state on St. Matthew's Day at this church every year.

NEWCASTLE PUBLIC LIBRARY.

THE first stone has been laid of a new building in Newcastle for the Public Library, and arrangements are made by means of which it will be opened with 20,000 volumes at least. The structure, it is stated, is to be "in the Corinthian and Doric orders of Classic architecture"; but, if we may judge from a fearful illustration, published in a local paper, it will have little to do with those admirable institutions. However, it promises to be a commodious building, and includes galleries for sculpture and painting. The façade will be 167 ft. in length, 30 ft. at each end being made to project. The principal entrance is in the centre, approached through a portico with Doric columns supporting an entablature which will be surmounted by a balustrade. This balustrade will be continued along the whole length of the building. Above this, in the recessed portions, panels will be formed in which subjects may be carved in relief. The centre portion will be surmounted by a pediment with attic, below which will be formed a cornice, with blocking course, terminating at the projecting ends. The bays at each end of the building will be furnished with a modillion cornice, surmounted by a balustrade. The roof is semicircular in shape, and the centre portion of the first-floor rooms will be lighted by skylights through a panelled ceiling, and by gas sunlights at night. The basement floor will be used for the ordinary working purposes of the Library. On the ground-floor there will be a lending library, 60 ft. by 42 ft. and 17 ft. 6 in. high; a library containing books for reference, 58 ft. by 36 ft., semicircular on plan, and 19 ft. 10 in. high. There will also be two reading-rooms, 43 ft. 4 in. by 28 ft., and 25 ft. by 19 ft. respectively, each 17 ft. 6 in. high. The whole of these rooms will be approached from the principal entrance-hall or vestibule, which will be 43 ft. long and 20 ft. wide. On the first floor the front rooms will be appropriated for pictures and sculpture, and will be 135 ft. long by 28 ft. wide, and from 23 ft. to 28 ft. high, divided by partition-walls fitted with sliding-doors, the whole arranged *en suite*. There will be four rooms set apart for science and art classes. These will be approached from the front street by a separate entrance, and although connected with the Sculpture and Art Gallery on the first floor, the working of these classes will be carried on distinct and separate from the working of the Library. The staircase and part of the walls of the vestibule or hall will be constructed so as to admit of extensions in case of further requirements. The light will be admitted through a large window on the staircase landing and from the roof. This portion will be 24 ft. wide, semicircular on plan, and 42 ft. high from floor to ceiling. The area of the site is 1,431 square yards, and will nearly all be covered by the building. The land and structural works are estimated to cost 20,000*l.* The architect is Mr. A. M. Fowler, the borough engineer.

THE RICHMOND SWIMMING-BATHS COMPETITION.

ANOTHER muddle! The instructions limited the competitors to 1,500*l.*, and the Committee have selected and recommended a design priced by the authors at 3,200*l.* A curious mistake, moreover, was made. The design selected was marked "Natation": so an envelope thus marked was opened, and found to contain the name of Mr. F. D. Lockwood. Inquiry, however, showed that he was not the right "Natation." Two designs were sent in so marked, and the real authors of the design selected were found to be Messrs. Elkington & Son, of Cannon-street, London.

Mr. Lockwood writes to us as follows:—"A clause in the instructions issued for the guidance of architects competing for the new swimming-baths states that 1,500*l.* is to be the limit of cost to be expended upon the works. A design has been selected which the architect estimates will cost 3,200*l.* to carry out. On behalf of the remainder of the competitors, I leave it to yourself and the ratepayers of Richmond to answer one question,—Is this justice?"

The *Twickenham Times* says:—"The plans of 'Natation' are of an attractive character, and give promise of baths that will be of great benefit to the town. To begin with the basement of the front building, provision is there made for a laundry, towel washing-room, engine-room, and engineer's workshop, two boilers, and a well with two pumps. On the ground-floor there are separate entrances for the first and second-class baths, a ticket-office, and nine first-class private baths. On the first floor there are sixteen second-class private baths, some of which are so apart from the others as to be available for ladies or special baths. Apartments for the attendant are set apart on the second floor. Corridors from the ticket-office lead to the first and second-class swimming-baths. In the first-class bath the water covers a surface 90 ft. by 27 ft. the depth increasing from 3 ft. 6 in. at one end to 6 ft. 6 in. at the other, and there are fifty-seven dressing-rooms arranged along the two sides. Behind this there is the second-class bath, with water covering a surface 51 ft. by 34 ft., the depth increasing from 3 ft. 6 in. to 5 ft. 6 in., and twenty-six dressing-rooms. The cost of the works is estimated at 3,200*l.* Several other plans were sent in, the cost varying from 1,500*l.* to more than 8,000*l.*"

THE ARCHITECT OF THE PARIS PANTHEON.

POSTHUMOUS homage has just been rendered to Soufflot, the architect of the Paris Pantheon, by exposing his portrait in one of the supplementary galleries of the Louvre. It was painted by Vanloo, and in the lower part of the frame there is a gilded plaque to which are affixed two golden medals representing the Pantheon from different points of view. Soufflot is depicted by the artist in the act of designing the monument which has immortalised his name. He wears a costume of apricot colour, and this, in the eighteenth century, was considered the pink of fashion. The portrait bears the signature, *Vanloo pinxit*, and has been given to the State by one of Soufflot's descendants.

Manuscript Architectural Work. — We find the following item in Mr. Young's Catalogue (12, South Castle-street, Liverpool). As to what the real value of the work may be we know nothing:—

"248. Fowler (J.), Domestic, Ecclesiastical, and Monastic Architecture of England and Wales, from the earliest times to the present century,

SPLENDID AUTOGRAPH MANUSCRIPT,

10 vols., most clearly and beautifully written, and profusely illustrated with about 3,000 engravings from various works (some scarce), water-colour drawings, pen-and-ink sketches, &c., of churches, castles, mansions, costumes, carvings, portraits, &c., half red morocco, holland covers, 52*l.* 10s., 1825-38, folio.—This unique and interesting work must have been the labour of a life-time, as well as a labour of love. It illustrates very completely our cities, cathedrals, castles, mansions, circles (such as Stonehenge, &c.), mosaics, carvings, &c. &c., and a vast number of works have been destroyed to get the engravings. From Dunn-Gardner's collection."

THE TRADE-UNIONS CONGRESS IN DUBLIN.

AMONG the subjects discussed last week at the Trade-Unions Congress in Dublin was that of steam-boiler inspection. Mr. Macduff (Glasgow) moved:—

"As a great number of accidents, caused by boiler explosions, result from the inefficiency of inspection, this Congress hereby instructs the Parliamentary Committee to urge upon the Government the great necessity of compulsory inspection."

This resolution was in reference to certificates of competency for men in charge of steam engines and boilers. They found, from a cause that lately took place in Glasgow, that while there was an engineer of experience to take charge of the machinery of the establishment, the inspection of the boiler was not thoroughly attended to; and, in fact, it appeared in evidence at the trial that some of the boilers had not been inspected for ten or twelve years, and plates that had been three-eighths of an inch thick had been allowed through corrosion and the weather to rot down to an eighth of an inch. At the explosion there were twenty-seven lives lost, and one firm had some twenty-seven boilers, all more or less, in a similar condition. That was evidence that compulsory inspection was required.

Mr. Johnson seconded the motion.

Mr. Rhodes (Dunstable) did not object to the inspection of boilers, but if it went forth that the inspection of boilers was quite sufficient for their safety it might prevent the more useful practice being put into operation, of having properly-qualified men in charge of boilers. It was much safer to have a qualified person in charge of the boiler, for his own life would be in danger if he worked at an unsafe boiler.

After other remarks,

Mr. Prior asked Mr. Macduff to add to his resolution:—

"And that it shall be an instruction to the Parliamentary Committee, in dealing with this question, to endeavour to keep it separate and distinct from the equally important subject of enginemen's qualifications."

Mr. Knight said Mr. Burt, M.P., who had charge of this subject in the House of Commons, absolutely refused to separate the two questions.

Mr. Macduff said he would adopt the addition to his resolution.

Mr. Coote said he was compelled to believe these inspections were almost always useless. As a rule the inspectors saw exactly what the head of the firm, or the interested party, chose to point out to them. He would sooner have the opinion of one illiterate engineman as to the condition of a boiler than that of twenty scientific theorists.

Mr. Nixon, of Newcastle-on-Tyne, joint secretary of the Miners' National Union, moved, as an amendment,

"That Mr. Thomas Burt, M.P., be requested to reintroduce in Parliament the resolution moved by him in 1879 on the subject of steam-boiler inspection and certificates of competency of men in charge of engines and boilers."

The amendment was carried by 48 to 28.

The Nine Hours System.

Mr. Burnett (London) moved,—

"That the Congress, recognising the vital importance of offering the most strenuous opposition to any attempt on the part of employers to extend the hours of labour, strongly advises the trades of the kingdom to unite for the common protection of the existing hours of labour, and empower the Parliamentary Committee to act, if necessary, as the medium of arranging a conference of those trades who may express a desire to federate for such a purpose."

He said the trade to which he belonged (the engineers) had undergone such vast expenditure and trouble on this question that he deemed it necessary to say a few words to the other trades on the subject. The nine-hours system had been introduced into the engineers' trade of the country in 1871, and the reduction of the hours of labour which the engineers then succeeded in obtaining was extended to other trades which previously had worked longer hours, so that the bulk of the trades in the country were interested in supporting the nine-hours system. The amount of wages which a man had to receive was doubtless one of the first questions for their consideration, but he ventured to assume that the question of the hours of labour was of greater importance than the mere question of wages. Wages rose and fell in accordance with the various laws affecting the labour market, but the hours of labour remained fixed, if not for all time, for a very great length of time, and it ought to be their object in dealing with the question of hours to bring them down to as brief a limit as possible. He referred to the operations of the Iron Trades' Employers' Association, which was the greatest organisation of capitalists in the country. Its proceedings were always conducted in private, and its reports were in the first place called private copies, and then they were afterwards told they were strictly confidential. Referring to one of those confidential documents, he pointed out that the most important portion of it related to the movement for the extension of working time. It went on to show the various steps taken by their association to increase the hours of labour, and referred with triumph to the fact that in Scotland in the beginning of 1879 the hours of labour were extended from 51 to 54 per week. It also referred to the fact that a conference had taken place between employers and men with the view of still further extending the hours of labour. If a time of temporary depression should enable the employers to extend the hours of labour, they should remember that a time of prosperity might enable the men to wrest back the hours of labour. The disputes at Huddersfield and Bradford were the principal disputes on the time question in which they had been engaged. In Huddersfield several of the shops had conceded the terms of the men, and were now working on the short-hours system. In Bradford the hours had been extended from 54 to 56½ per week, and now, after a strike of nearly eighteen months' duration, their society had only within the past few weeks achieved a complete victory, and, with a few exceptions, all the shops in Bradford are working on the short-hours system. They wanted to point out to the trades of the country that although they were able to supply the sinews of war from 20,000*l.* to 25,000*l.* in addition to the ordinary benefits of the society, other societies might not be so strong and well able to resist, and therefore they urged upon them the necessity of joining in this combination to protect the hours of labour.

Mr. Guile seconded the resolution. The employers had set them such a very good example of united effort that it was just as needful,—nay, more so on their part,—that they should combine and protest against being robbed of this one hour privilege each day, as it was for the employers to enforce it again on the working men of this country. If the employers got ten hours' work out of them for nine hours' pay, they could go into the market retaining the same margin of profit on their capital as heretofore. He would say the time was coming when, if all who ought to work did work, not nine hours', but six hours' work would be sufficient to supply the wants of the country.

Mr. Ashton thought the hours of labour question was a more vital one than that of wages He held that with the improvements in machinery, which enabled work to be performed in a shorter time, the labourer should have a benefit in reduced hours of labour. He pointed out that although Mr. Burnett's trade might boast that they were working only nine hours a day, yet the members of his trade, as well as others, were always ready to work overtime when they got the chance of earning a few shillings by it. He held that if they had to work a certain number of hours per day, they ought to cease labour at that time, and refuse to work overtime under any inducement.

Mr. Thom (Edinburgh) suggested an amendment, and

Mr. Burnett subsequently put his resolution in this shape:—

"That this Congress, recognising the vital importance of offering the most strenuous opposition to any attempt on the part of the employers to extend the hours of labour, strongly advises the trades of the United Kingdom of Great Britain and Ireland to unite for the common protection of the existing hours of labour where they have been reduced, and to take the earliest opportunity of equalising them with the lowest basis which has been obtained; also to empower the Parliamentary Committee to act, if necessary, as the medium of arranging a conference of trades which may express a desire to federate for such a purpose."

Mr. J. Ward (Dublin) seconded the amended resolution which, after a long debate, was unanimously carried.

On Friday, the following resolution, in favour of apprenticeship, was carried, and is a direct confirmation of the views put forth in the article upon the subject in last week's *Builder*. Mr. Nanetti (Dublin) proposed,—

"That this Congress is of opinion that a regular system of indentured apprenticeship, extending over stipulated periods, is the best means of developing technical knowledge, and increasing the skill of workmen in the United Kingdom."

Mr. Avens (London) seconded the motion.

Mr. Clarke thought this was a question for each individual society to deal with, and not for the Congress at all.

Mr. Fitzpatrick (Liverpool) concurred with Mr. Clarke.

Mr. Davey moved an amendment, to the effect that the question could not be adequately dealt with by the Congress, and could only be dealt with by the separate trades.

After a lengthened discussion, the amendment was rejected and the resolution adopted.

The Congress was brought to a close on Saturday last, when the next place of meeting was considered, and the following places were voted for:—Durham, 20; London, 19; Manchester, 15; Belfast, 8; Swansea, 7. The final division lay between Durham and London, and the latter received 35 votes, Durham getting 30.

The subject of strikes and lock-outs was then considered, and the following resolution passed on the motion of Mr. Coote, of London:—

"That in the opinion of this Congress, the time has arrived when measures should be taken to bring into closer union the somewhat estranged relationships of capital and labour, and to place them upon a basis that will, in the future, prevent strikes and lockouts from paralysing the industry of the country. With this purpose in view, the Congress recommends to the consideration of all interested in the welfare of masters and workmen the desirability of establishing local and central courts of arbitration throughout the United Kingdom for the purpose of settling all trade disputes upon the principle of equity to all concerned."

On the suggestion of Mr. Sedgwick, who seconded the motion, the word "employers" was substituted for "masters," which was deemed offensive.

THE STATUE OF ROBERT RAIKES ON THE EMBANKMENT.

WITHIN the last few days passengers along the Embankment between Waterloo and Charing-cross have had their attention attracted to the taking down of the statue of Robert Raikes, the founder of Sunday Schools, which was erected only some two or three months ago, on the occasion of the Sunday School Centenary. The statue itself, as well as the granite pedestal on which it stood, described in our columns at the time, have been removed from the site, and the former taken away and placed under lock and key, pending the permanent foundation and basement works now in progress. The explanation offered of the removal of the structure is that its erection was only of a temporary character, in order to admit of the inauguration of the statue during the centenary week, and that for this occasion the pedestal and the statue were erected on blocks of timber. The entire structure having now been removed, the site upon which it will permanently stand in the Embankment Gardens has been excavated for the foundations to a depth of about 20 ft., and a portion of the area, about 20 ft. square, has been filled in with concrete, upon which the pedestal and statue will be permanently erected. Messrs. Mowlem, Burt, & Co. are executing the work. If the explanation given be correct, certainly it is the oddest proceeding that we have heard of for some time. Ordinary people would fancy that a temporary wooden pedestal, removable with little trouble and expense, might have been made to serve the immediate purpose.

Convalescent Hospitals.—By the aid of a generous donor (who gives 6,500*l.* conditionally on the establishment at once of a seaside branch home), the Committee of Management of the Metropolitan Convalescent Institution has secured a freehold site at Bexhill-on-Sea, near St. Leonard's, and plans for a building capable of accommodating 100 inmates have been prepared and approved by the Board. The cost of the land, building, and furnishing complete, is estimated at about 12,000*l.* The Committee of Management have already entered into a contract for the erection of so much of the building as will receive fifty inmates, and they ask for funds to enable them to fit up and furnish that portion, and also to complete the rest of the building at once. Mrs. T. Brassey has promised to lay the foundation-stone of the new building early in October.——The Princess Christian has consented to open the Convalescent Hospital for the county of Hertford, at St. Leonard's-on-Sea, on October 21st. The Marquis of Salisbury, the Earl of Chichester, and a large number of county gentry are expected to be present.

WESTMINSTER PUBLIC OFFICES COMPETITION.

ON Tuesday last, at a vestry meeting of the united parishes of St. Margaret and St. John, Westminster, Mr. George Andrew Spottiswoode in the chair, the report of the referee, Mr. Barry, on the ten designs submitted for new offices, was considered. The referee had selected three designs, and placed them in the following order:—No. 1, "Stet"; No. 2, Portcullis in circular strap; and No. 3, Black Star.

The estimated cost of the vestry offices alone (*i.e.*, exclusive of the Large Room), in each case is as follows:—

	Author's Estimate.	Mr. Barry's Estimate.
"Stet"	£10,032	£15,779
Portcullis	15,000	16,188
Black Star	15,000	16,493

After discussion, the report was adopted, and the letters accompanying the designs being opened, the respective authors were found to be—

No. 1. Messrs. Lee & Smith, 7, Queen Victoria-street.
No. 2. Mr. John E. Trollope, Elm Field, Streatham.
No. 3. Messrs. Hunt & Steward, 3, Victoria-street.

The cost of the Large Room is thus estimated by Mr. Barry:—In the case of No. 1, 6,313*l.*; No. 2, 7,547*l.*; and No. 3, 4,705*l.*

It was decided to exhibit publicly all the designs as soon as possible, and it will be then, of course, open to any of the architects to affix their names to their designs, should they so please. The matter was referred to a committee for further report.

Mr. J. E. Trollope, the second prizeman, is a younger son of Mr. Trollope, of Parliament-street.

THE CHURCH OF THE PASSIONISTS (ST. JOSEPH'S), HIGHGATE.

THIS (R.C.) church, which was opened on the 12th ult., has been elaborately decorated. The base of the nave walls is of black and gold marble; above this, to the top of the confessional arches, the walls are stencilled with the various emblems of the Passion in green on a lighter ground of the same colour, the whole being surrounded by a fretwork band of a reddish colour. On either side of the nave are recesses containing the confessionals, worked in pitch-pine and varnished. Between the tops of the Confessionals and the moulding under the windows are panels in various shades of colour. Above this are the new stained-glass windows, with ornamental panels between them, and a painting of the Crucifixion. The ceiling of the nave is panelled in various shades of grey. The cornice is decorated, and has the fascia relieved with a running pattern of passion-flowers and leaves in natural colours. The lighting is effected by means of star pendants. The font, of a carved Gothic design, stands in a chapel, which also answers the purpose of a baptistery. The Lady-chapel and the Chapel of St. Paul of the Cross stand on either side of the sanctuary, and form the transepts. In the Chapel of St. Paul of the Cross a new altar has been erected, and a stained-glass window of the Agony in the Garden fixed in the side wall. In the lady-chapel there are two more stained-glass windows, one representing Our Lady of Lourdes, and the other the Annunciation. Both chapels have paintings over the altars, and are decorated in gold and colours. The sanctuary and high altar glitter with gold and colour. On the left-hand side of the sanctuary is a pulpit of inlaid wood, and on the opposite side the altar of the Sacred Heart. The stalls and seats are of pitch-pine, varnished.

The architect is Mr. Albert Vicars, of London; the contractors are Messrs. Kelly & Son, of London. The painted and other windows, the painting of the Crucifixion, and the medallions, were painted on zinc by Messrs. Mayer & Co., and the new altar was erected by Mr. Thomas Heath.

Sanitary Prize Essay.—The Government of India has offered a prize of 100*l.* for the best "Manual of Hygiene," to serve as a text-book for the use of the British soldiers in that country. Works submitted in competition for this prize must be sent in by their authors to the Secretary to the Government of India in the Military Department at Calcutta, so as to reach his hands not later than the last day of next March.

MOULDED BRICKS: RED TERRA COTTA.

WE cannot pretend to mention all the makers of terra cotta who have sent us drawings and specimens of their ware, but it is certainly satisfactory to learn that if architects desire to use this material, or to introduce moulded and ornamental bricks, they will not find much difficulty in obtaining what they want, whether it be in having their own drawings carried out or adapting ready-made articles. As amongst the best of the specimens that have reached us, we may mention some red terra-cotta work and ornamental bricks of the same colour sent by Messrs. Arthur Gee & Co., of Stafford. The material appears to be excellent, and good taste evidently presides over the preparation of designs for stock.

THE LIABILITY ACT.

SIR,—Now that the Employers' Liability Bill has become law, in what way does it affect the liability of servants to the masters for damage done to furniture in customers' houses during the execution of works? During the past month my workmen, while decorating rooms, have broken two glass chandeliers, which, of course, I have had to replace. Can I make the workmen pay the whole or part of the cost?

Also, if workmen catch cold while repairing roofs or other outside works, and are obliged to be at home for a day or two, in order to get well, am I bound to compensate them for this loss of time? AN EMPLOYER.

GLASGOW MUNICIPAL BUILDINGS COMPETITION.

SIR,—As one of the competitors who have adhered to the condition requiring absence of colour and etching, I consider myself entitled to ask how Mr. Barry can justify evasion of this stipulation on the part of so many of the competitors. The condition was distinctly geometrical outline; and the shading of windows in first and second premiated designs and in so many of the others, violates the spirit of that requirement. I presume this was not sanctioned in reply to any query from intending competitors, otherwise the Council would have seen their way to issue amended conditions to every competitor, so that all might be on the same footing.

It is true Mr. Barry or any professional man of skill and probity would give no weight to the adventitious effect thus obtained; but it is not in human nature to avoid being influenced by effect as well as merit, and we all know there is such a matter as the art of putting things which in this age of superficial judgment is by no means to be ignored.

However this may be, the fact remains that the first and second premiated designs have had advantages which were by the conditions inferentially forbidden. Another and more important point of objection to Mr. Barry's award consists in the architecture of Mr. Corson's design, which I should imagine scarcely seconds the wishes of the Council that the style employed should be of a broad and dignified rather than florid character. The style chosen may be appropriate for a comparatively small building, but, his own design being witness, does not easily lend itself to an extensive subject.

Note the repetition of stories, none being in reality dominant, the absence of breadth, the repetition of similar parts, which of itself is calculated to destroy interest; the fact that there is neither base nor crown in the proper sense; the fact that the style does not afford a tower of the form employed, and Mr. Corson has therefore had to touch the border-land of Gothic architecture, with a resulting incongruity. The fact, however, that Mr. Corson has followed Mr. Carrick's plan in its chief features is, I think, a merit, in the light of the conditions issued, apart from the question whether that plan was the best or not. With this, as competitors accepting certain conditions, we had nothing to do. Undoubtedly, a finer plan can be produced, and has been by some of the competitors (to whom it would be invidious to refer), and so afforded them opportunity of conceiving most excellent elevations.

It is gratifying that Mr. Barry has recognised this condition, and limited himself, in choosing, to those designs which adhered to it; for it is evident that those who disregarded this stipulation, working free of its fetters, enjoyed an advantage not really conferred by the conditions, however desirable it may have been.

MENDELSSOHN.

GRAINING AND MARBLING.

SIR,—In answer to the letter in your issue for September 11th, from "A Poor Grainer," will you allow a very old hand at the trade to state what he believes to be the principal causes of the decline of what "A Poor Grainer" considers art? I have always thought that art, technically speaking, was and is something more than learning to copy such inanimate subjects as woods or marbles, no matter how beautiful the colours or forms they present.

To call such work "art" is just as much out of place as to call the thousands of very poor imitations by poor artists that we see exposed for sale artistic.

What I consider one of the causes of what was once, no doubt, appreciated is that like most new-fashioned things, it has had its day.

Your correspondent must not forget that marbling and graining is only a profession of modern growth, little more than a lifetime since first invented; but, like other trades, it may take more than a lifetime to bring to perfection. No doubt there are some really clever men in the trade who show an amount of artistic feeling for their work; but for one of that class how many hundreds are there who have not the slightest idea of what they are supposed to be imitating, never having taken the trouble or incurred the expense of procuring the smallest specimen of either the woods or marbles requisite?

There are a large number of the so-called grainers who endeavour to perfect themselves by attending a public school,—no doubt, very large and cheap, viz., walking round the shops on Sundays.

I feel quite sure that, were it not for the supposed economy in having work (graining being varnished) that would hide the dirt or bear the scrubbing-brush, we should never have had so much graining in use.

Architects and decorators seem to be getting a little better educated in such matters than they were, and are falling back on the old-fashioned honest work that was in existence before graining and marbling were thought of.

In the old style of decoration for interior work there was some really artistic work required and done, which, let us hope, may be done again, and enable the numerous artists to get a share of the employment their natural abilities and education may entitle them to.

Another very decided cause for the decline of the trade is the action of grainers themselves, who are entirely responsible for the effect; that is, the system of piece and measurement work so generally in vogue. How is it to be expected that the system of making grainers, adopted by the so-called grainers to the trade, could be otherwise than prolific in the supply of "poor" grainers? A grainer succeeds in getting a connexion among small builders, painters, and others by giving his services at a lower rate per yard than usual, and, to enable him to make a profit sufficient to live by, he has to employ at first one boy, to be supplemented by a number more, each in a few years to compete with his late master and each other, thereby overstocking the trade with a very large amount of very poor grainers in every sense of the word.

J. M. G.

GILDERS AND PREPARERS.

AN APPEAL.

SIR,—At a very crowded meeting, held in the theatre of the Charterhouse, as already mentioned in the *Builder*, on Monday, September 6th, on the very great depression in the above trade, the Rev. Stewart D. Headlam, B.A., in the chair, on a show of hands being called for, it was proved that nearly one-half of the gilders and preparers in that meeting were out of work, many of them having been out of employment for four or five months. It has been proposed to form a Gilders' and Preparers' Society for the East End of London. This will cost some amount of money, not only in forming the society, but to relieve the men out of work. We, therefore, ask for some little assistance to enable us to get over the present depression in the gilding trade. We do not make this appeal so much for ourselves as for our wives and families. We humbly ask your readers, previously to sending money to the poor in foreign nations, not to forget the poor gilders and preparers in the East End of London.

Subscriptions will be most thankfully received by the Rev. STEWART D. HEADLAM, B.A., Charterhouse, Goswell-road; or by your humble servant,

GEORGE RYAN,
Secretary *pro tem.* of the Provisional Committee.
19, *Berwick-street, Oxford-street.*

DISCREPANT TENDERS.

SIR,—I much regret seeing the tenders for Tehidy Villa made public, and consider it very bad grace on the part of the contractor, who, unauthorised, has taken upon himself to publicly expose what I believe must have been errors on the part of his fellow competitors, and which compelled me to accept an estimate my experience teaches me to be reasonable.

Considering the inconvenience caused by the limited time, &c., allowed for the preparation of the estimates, it was my last wish that any discrepancy on the part of the contractors who so kindly obliged me with tenders should have been offered to public criticism.

G. T. HOWELL.

P. S. I shall feel greatly obliged if you will allow my opinion to be known publicly.

EASTBURY HALL, NEAR BARKING.

SIR,—As the proprietor of the largest share of this family estate, I should be much obliged if you would correct the inaccuracy in the history of the title to it given in the account published in the *Builder* of September 4th last. The history is correct down to 1557, when John Keele sold the property to Clement Sisley,—not Sisby,—who probably built the house. Thomas Sisley parted with it to Augustin Steward in or before 1608. Martin Steward sold it to Jacob Price in 1628, and George Price sold it in the year 1646 to William Knightley, whose widow conveyed it in 1650 to Sir Thomas Vyner, alderman of London. In 1714 his representatives sold it to William Browne, whose nephew, William Sedgwick, parted with it to John Weldale in 1740. This is the last time the estate was sold. Anne Weldale, daughter of the above John, by her will bearing date 1773 devised it to her relative Mary, wife of the Rev. Wasey Sterry, with remainder to her issue; and the property is still in the possession of her descendants. There was a Mr. Brushfield tenant in 1796; but this fact hardly accounts for the statement in the *Builder* of September 4th, that "the manor was sold by Mr. Bushfield in 1845 to Mr. Sterry."

If I do not notice one or two other statements in your report which do not concern the title to this property, it must not be supposed that I admit their accuracy.

I may add that on the termination in the year 1875 of the farm tenancy of Mr. Whitbread, referred to in your article (which tenancy commenced in 1858), a sum of upwards of 600*l.* was laid out by the freeholders in repairs then found necessary to the mansion-house, buildings, and fences on the farm; and during the last two years other large sums have been similarly expended by them on this estate.

FRANCIS STERRY.

Poltimore Rectory, Exeter.

RAILWAY ACCIDENTS.

SIR,—Of late there has been an undue prominence of these "accidents," and there appears to be a desire to place the matter on a wrong issue.

I submit, they result in a great measure from original faulty construction, *i.e.*, sharp curves and steep gradients, and also from excessive speed,—a matter requiring attention.

As regards "faults" in construction, I can predicate on certain points where these so-called accidents from preventible causes, bad construction and high speed, may occur.

The remedy lies in these two directions, principally in the former, and to this legislative attention should be directed; all the break power in the world will be nugatory, and, in fact, it is a question whether injury to the permanent way is not effected by a too-sudden application of break power.

NEMO.

PERSONAL.

SOME of our old customers having been misled by some one having started another firm in the name of J. Smeaton & Sons, at our old address, Nos. 9 and 10, Wych street, Mr. John Smeaton, so long connected with the firm of Messrs. W. Smeaton & Sons, Howland Mews, Howland-street, Tottenham Court-road, W., and 24, Moorgate-street, E.C., will be glad if you would notice in your columns that he has no connexion with any other firm than the undersigned.

W. SMEATON & SONS.

Miscellanea.

Statistics of Accidents.—The manager of the Accident Insurance Company, of Bank-buildings, has published details of the accidents the company in question has paid for during the last ten years, and they furnish ample testimony of the usefulness of insuring against the casualties of every-day life, apart from those that arise from risky occupations. 11,703 claims are accounted for as follows:—5,448 in riding, driving, and walking; 2,974 in business and professional accidents; 1,555 home and domestic disasters; 417 cases in travelling by sea and land; 271 injuries through animals, birds, and insects; and 1,038 through sports and pastimes.

Ecclesiastical Art Exhibition, Church Congress, Leicester.—The Loan Collection is larger than last year, and embraces upwards of 400 separate exhibits. Embroidery, both ancient and modern, is largely represented. Mr. C. Watkin Williams Wynn shows two missals, printed at Paris in 1501 and 1503, and the corporation of Leicester have sent a copy of the Sarum Missal, belonging to the Old Town library. No one subject is so thoroughly illustrated as that embraced by Mr. William Bragge's collection of Russo-Greek "Icons," or religious pictures.

The Printers' Almshouses, Wood-green. The new blood introduced into the management of the Almshouses at Wood-green is patent, not only by the fresh vigour with which subscriptions have been raised and the necessary repairs are being carried out, but by other signs, one of which it affords us sincere pleasure to notice. However healthy and comfortable almshouses may be, the inmates will not be much benefited if their daily rations are insufficient in quantity or quality; and yet this is (perhaps we should now say, has been) the fact in some cases. The Biggs Charity is an unspeakable boon, and when added to the endowment-money makes enough for an old couple to live upon; but when, as often happens, the husband dies and leaves the widow deprived of the Biggs annuity, she may, and often does, find herself reduced suddenly to live upon 5*s.* or 6*s.* per week. Strongly feeling that no inmate of the almshouses should have less than 9*s.* or 10*s.* per week for maintenance, a few friends have subscribed together and have arranged that, for the next six months at any rate, such a state of things shall be remedied. Full investigation has been made in each case, and Mrs. W. H. Collingridge having received the promise of assistance from other ladies, has thus far kindly acted as almoner. This movement promises to lead to a systematic and friendly visitation of all the female inmates, which will result, we believe, in much good. We think that in every case where by the death of the husband the widow who remains in the almshouses has a less total income than 10*s.* per week, the next Biggs annuity for women should be awarded her.—*The Printing Times and Lithographer.*

Fall of a House in Oxford-street.—About half-past six o'clock on the morning of the 17th inst., the inhabitants of Oxford-street, in the neighbourhood of the Princess's Theatre, were greatly alarmed by hearing a tremendous crash. This was found to have been caused by the fall of the premises, No. 72, Oxford-street, adjacent to the theatre, in the occupation of Messrs. Cook & Burchett, goldsmiths and jewellers, which utterly collapsed. The building was a perfect wreck, and the stock of Messrs. Cook & Burchett, worth several thousands of pounds, is buried among the *débris*. Fortunately the inmates of the house had time to escape unhurt. It seems that a house on the west side of it had been demolished, to improve the entrance to the theatre (now in course of construction). To this is ascribed the downfall. The escape of the occupants appears to be due, under Providence, to their own watchfulness and energy. The aspect of the place the next day was terrible; joists and tables, partitions and chairs, "in one dread ruin blent." Such an occurrence, although fortunately no lives were lost, ought not to be allowed to pass by without a searching inquiry. Were the premises, after the removal of the adjoining house, insufficently shored up, or had the foundations been tampered with? When we saw the ruins some of the adjoining premises seemed to us to be in a risky condition.

Art and Health at the Social Science Congress.—In the Art Department, the discussion on the first special question, "Ought there to be a School of Dramatic Art subsidised by private subscription, or endowment, or by the State?" will be introduced by a paper by Professor Fleeming Jenkin; and Mr. Hubert Herkomer, A.R.A., will contribute a paper on the second question, "How far would the revival of the old system of 'master and pupils' be of advantage, and tend to promote the growth of historical art in the country, and the fitting use of painting and sculpture in our public buildings?" Professor Jenkin will also read a paper on the following question in the Health Department, "What is the best mode of amending the present laws with reference to existing buildings, and also of improving the sanitary condition, so as to render them more healthy, having due regard to economical considerations?" And in the same department, the discussions on the special questions, "What are the best areas for sanitary purposes, and how far should there be a revision of the mode of electing and continuing the services of the officers under the Public Health Acts?" and "What are the means which should be adopted for the prevention of the pollution of streams, without undue interference with industrial operations, and for the preservation of pure sources of water supply?" will be opened with papers by Sheriff Spens, of Glasgow, and Dr. Stevenson Macadam, of Edinburgh.

University College, Bristol.—The new buildings in Tyndall's Park will be ready for use on the 1st of October. In the old buildings the complaints of overcrowding have been frequent, and must have materially hindered the progress of the college. But nothing will be heard of the complaints in future. The new buildings are, indeed, only a small part of what are required to complete the plan, but they do provide all that is necessary for health and for some degree of comfort. The experimental courses of instruction, those of chemistry, physics, and engineering, are to remain for the present in Park-row. The reason of this is that, as the new buildings would not give comfortable accommodation for all, it was thought best to retain in the old buildings the classes in those subjects for which separate rooms are required. Thus four rooms will now be set apart for chemistry, two for physics, and two for engineering. But in the new buildings each of the rooms will, as a rule, be used at different times of the day by several professors and lecturers. Thus five rooms will be made to do duty for mathematics, geology, zoology, botany, political economy, modern history, English literature, Hebrew, French, and German. But the same room will never be used for more than two hours consecutively; and all the rooms are 16 ft. or more in height, and are ventilated on Mr. Haden's system, by which the bad air is all drawn off into a high ventilating shaft; so that the students can feel that they are sure of always having a good supply of fresh air. The new buildings will be open to the inspection of the public for the first six days of October. Mr. Hansom is the architect.

Clerkenwell Workhouse.—The guardians of the Holborn Union have received a letter from the Local Government Board, stating that they had considered the proposal of the guardians to erect a new workhouse, clerk's offices, relief offices, and dispensaries, on the site of the old Clerkenwell workhouse in Farringdon-road (formerly Coppice-row). The Board say that they have given this proposal their most careful consideration, but regret that they are unable to concur with the guardians in thinking it desirable to provide on so small a site as that of the Farringdon-road Workhouse, in addition to various offices, accommodation for so large a number of paupers of the aged and infirm and acute sick classes as that proposed. It appears to the Board that on so limited an area it would be most objectionable to erect a building of such an unusual height, and to appropriate the five upper stories thereof to the accommodation of the classes of paupers above mentioned, the three lower stories being set apart for administrative and other offices. Moreover, the proposal includes in the lower stories an extensive washhouse and laundry, a kitchen, and a furnace room for the supply of hot water, &c., from which vitiated atmosphere would necessarily be conveyed, by means of the lift-shafts and staircases, to the upper part of the premises. The Local Government Board fully recognise the great care and skill which have been bestowed on the preparation of these plans; nevertheless, having regard to the large number of sick and infirm people whom it is proposed to place in so large a site, and to the fact that the site is partially appropriated to other purposes, the plans appear to the Board inadmissible. The Board feel that they have no alternative but to request the guardians to look out for a more suitable site.

Fever at Wormwood Scrubs Prison.—Evidence was given at a recent inquest that prisoners at Wormwood Scrubs have been suffering from typhoid fever, attributed to the pollution of the air by piggeries in the neighbourhood in a shocking state of filth. These piggeries have long been known and condemned, but their agency in the present case is by some denied. How is the prison drained?

Royal Institute of British Architects.—The last published part of "The Transactions," No. 12, consists of notices of deceased members, all foreign with the exception of the late Professor Edward M. Barry, and including J. P. Cluysenaar (Brussels), Pascal Coste (Marseilles), and Joseph Louis Duc (Paris). They are very well done, and very interesting.

Church Restoration at Sheffield.—The parish church of Sheffield, which has been closed for several months for the purpose of undergoing restoration, has been enlarged and beautified at a cost of 20,000*l.* The church will be re-opened on the 26th of October, when the Archbishop of York will preach.

Accident on the South-Western Railway.—When one accident happens others are always heard of. The terrible accident at Nine Elms on Saturday night (the 11th inst.) was followed by another early on Tuesday morning, on the London and South-Western Railway, between Brookwood and Farnborough, and about two miles from the former, which, however, was happily unattended with loss of life, though much damage was done to the rolling stock. The *Surrey Advertiser* says,—At a portion of the line near the Aldershot Junction, and close to Curzon Bridge, the Basingstoke Canal and the railway run parallel, and the canal being on a higher level they are separated by a brick wall, 12 ft. high and 300 or 400 yards long. The canal is being cleaned out, and in order to render the operations practicable was dammed up at this part. On Monday night the rain was very heavy, and, it is supposed, caused the canal embankment to give way. Nearly 40 yards of the wall was broken down by the sudden rush of water, and the *débris* fell on to the up-line, whilst the rails for some little distance were covered with about 9 in. of water. About half-past one the 5·15 p.m. up goods train from Yeovil, made up of an engine, two guards' vans, and upwards of thirty trucks, laden with general goods, one cattle-truck, carrying some eight or nine beasts, came along, and the night being very dark, the engine ran right into the fallen brickwork, being lifted bodily from the metals and sent on to the embankment, where it rested on its side. Twenty of the trucks, with one of the guards' vans, were also thrown off the rails.

The Art of Old Japan: its Uses and Abuses in England.—A lecture was delivered on Monday evening, at the Masonic Hall, New-street, in connexion with the Birmingham School of Art, by Mr. C. Pfoundes, of London (for many years resident in Japan), the subject being "The Art of Old Japan: its Uses and Abuses in England." Mr. J. H. Chamberlain presided, and there was a large attendance. The lecturer, in the course of his very interesting address, said, that the true Japanese art was greatly abused, there being in the imitations gross errors, not only of misconception, but also in the adaptation of Japanese design, resulting in one mass of heterogeneous incongruities, that had only the merit of being novel and "the fashion." There was nothing patchy or "scrap" in Japanese true works of art when they thoroughly understand the subject, but there was a great deal that was patchy and "scrap" in that copied Japanese ware which came from Stafford and Worcester. It was not desirable that they should become mere copyists, and he was not going to point out a royal road to pilfering novelties from an alien art while their own faculties were permitted to lie dormant. He appealed to them rather to take to heart a lesson from the Japanese, and rouse themselves to original thought, to the study of the great book that was always open before them, and, whilst carefully bearing in mind the precepts of their art instructors, to avoid blindly following paths they knew not of; to do as the Japanese had ever done,—train their minds, and exercise their natural faculties to be observant of the beauty that always surrounded them.

George Stephenson.—A marble tablet was placed with ceremony in the Turin Railway station on the 10th inst. to commemorate the fiftieth anniversary of the opening of the first railway between Liverpool and Manchester.

Wood-working Machinery in Australia. We notice that in addition to the medals awarded at the Sydney Exhibition, Messrs. F. W. Reynolds & Co., of Acorn Works, Blackfriars, have received a special prize at the Brisbane Exhibition.

Inner Temple.—The greater portion of the old block of buildings on the east side of Tanfield-court, Inner Temple, is now in course of demolition to make way for extensive additions about to be made to the library of this society. Plans have been prepared by Mr. Edis, and the works will be commenced immediately.

Tunnelling the Alps.—The boring of the Arlberg tunnel through the Alps is in active progress on the Austrian side of the mountain, and ground will shortly be broken on the Swiss side. The St. Gothard line in its entire length is expected to be in running order in April next.

Frome.—A stained-glass window has been placed in Holy Trinity Church, in this town, in memory of the late Mrs. W. C. Cruttwell. It is by Mr. Morris, and consists of one light, containing a full-length figure of St. John the Divine.

TENDERS

For erecting two warehouses at Homerton, for Mr. W. Chapman. Quantities not supplied:—

Tooley	£1,123 10 0
Trench	863 0 0
Govart	787 10 0
Brown	772 10 0
Child	748 0 0
O'Keefe	710 0 0
Russell & Cowley	698 0 0
Evans & Lewis	676 0 0
Jones	650 0 0
Baxter	650 0 0
Vaughan	635 0 0
Haines	629 0 0
Taylor	620 0 0

For alterations and additions to No. 84, Carlisle-street, Marylebone, for Messrs. Evans & Davies. Mr. E. Monson, jun., architect:—

Millson	£348 0 0
Trench	298 0 0
Beach	295 0 0
Sawyer	291 0 0
Ternley	285 0 0

For house for Mr. Kaye, at Woodford, Essex. J. T. Bressey, architect:—

Reed	£2,054 10 0
Harper	2,049 0 0
Brown	1,675 0 0
G. & F. Croaker	1,358 0 0
Shepherd	1,340 0 0
Wells	1,295 0 0
North, Bros.	1,245 0 0

For forming roads, &c., George-lane, Wanstead. Mr. J. T. Bressey, surveyor:—

Pizzey	£589 0 0
Jackson	555 0 0
Mundy	550 0 0
Bell	487 0 0
Cardus	475 0 0

For house for Mr. A. Miller, at Wanstead, Essex, Mr. J. T. Bressey, architect:—

Harper	£1,020 0 0
Bragger	986 0 0
Arber	943 0 0
Mundy	895 0 0
Willmott	795 0 0

For sewerage works for the Arnold Local Board of Health:—

Cook & Bennett, Spalding	£9,972 0 0
Bell, London	9,181 0 0
Pearson, Hull	9,110 11 7
Smith, Manchester	9,043 12 0
M'Kenzie & Co., London	8,600 0 0
Coupe, Ripley	8,306 0 0
Rushworth, Nottingham	8,299 7 8
Dawson, Bury	8,169 0 0
Thumbs, Nottingham	7,950 0 0
Knight, Loughborough	7,875 15 7
Greaves, Arnold	7,798 10 9
Tomlinson, Messrs., Derby	7,770 0 0
Meats, Bros., Nottingham	7,538 2 4
Johnson, jun., Derby	7,533 5 8
Dobb & Gummer, Rotherham	7,347 0 0
Jeffries, Conway	6,967 5 4½
Smart, Nottingham	6,924 0 0
Dovenor & Quesnel, Stoke-on-Trent	6,871 1 0
Cordon, Nottingham (accepted)	6,680 0 0
Wayte, Arnold	6,400 0 0

For the erection of three new houses adjoining (one with gateway), and a new warehouse at rear of, No. 140, Abbey-street, Bermondsey, and the conversion of present house (No. 140) into two smaller houses, for Mr. Wm. Wilkins. Mr. Edward Crosse, architect. Quantities supplied:—

Friggens	£3,128 15 6
Preston (too late)	3,045 0 0
Almond	3,008 0 0
Eldridge & Gee	2,990 0 0
Kipps	2,988 13 3
Bullers	2,885 0 0
Wells	2,785 0 0
Rider & Son	2,743 0 0
Croaker	2,723 0 0
Greenwood	2,709 0 0
Downs & Co.	2,636 0 0
Tarrant & Son	2,636 0 0
Battley	2,490 0 0
Winsor (accepted in part)	2,414 16 0
Brockwell	1,893 0 0

For eight warehouses, Edmund's-place. Mr. George Vickery, architect:—

Scrivener & Co.	£13,783 0 0
Hart	13,386 0 0
Morter	12,947 0 0
Colls & Sons	12,790 0 0
Brass	12,713 0 0
Ashby, Bros.	12,620 0 0
Lawrence	12,375 0 0

For foundations to warehouses in Farringdon-street. Mr. George Vickery, architect:—

Hart	£2,630 0 0
Crabb	1,990 0 0
Brass	1,973 0 0
Lawrence	1,883 0 0

For additions and alterations at the Rectory at Hornsey, and works connected with the glebe lands, &c., for the Rev. James Jeakes. Messrs. Wadmore & Baker, architects:—

Conder	£1,735 0 0
Clarke & Bracey	1,735 0 0
Scrivener	1,710 0 0
Ashby, Bros.	1,697 0 0
Shurmur	1,683 0 0
Dove, Bros.	1,585 0 0
Mattock, Bros.	1,407 0 0

For building a detached cottage, St. Mary's-grove, Barnes, for Mr. H. Wood. Mr. Charles Turner, architect:—

Tozer (accepted)	£1,200 0 0

For rebuilding No. 8, King's-road, Chelsea, for Mr. R. W. Livingston. Mr. George Fagg, architect. Quantities supplied:—

Thorne	£2,100 0 0
Hoare & Son	1,998 0 0
Lathey, Bros.	1,973 0 0
Macey & Sons	1,962 0 0
Clark & Bracey	1,832 0 0
Smith	1,795 0 0
Richardson	1,779 0 0
Craske	1,730 0 0

For the erection of New Town Schools, Devizes, for girls, cooking-school, and third-grade school. Mr. Henry Weaver, architect. Quantities supplied:—

Light & Smith, Chippenham (too late)	£1,187 0 0
W. & F. Long, Bradford-on-Avon	1,150 0 0
Chivers & Son, Devizes	1,095 0 0
Ash, Devizes	1,091 0 0
Webb & Powney, Bromham (accept.)	1,020 0 0

For house and farrier's shop at 156, High-street, Shadwell, for Messrs. Worrow. Mr. A. B. Hudson, architect:—

Faulkner	£1,237 0 0
Nixon	1,124 0 0
Moyle & Son	1,100 0 0
Wilson & Exton	1,040 0 0
Spencer & Co.	1,015 0 0
Hearle & Son	893 0 0

For the erection of a detached house in Netherhall-terrace, Hampstead, for Mr. Thomas Fall. Messrs. New & Son, architects:—

Bird	£4,426 0 0
White	4,400 0 0
Keys & Head	4,361 0 0
Phillips & Son	4,328 0 0
Harris & Sons	4,294 0 0
Scrivener	4,283 0 0
Mark	4,235 0 0

For carrying out the first section of the roads at St. Peter's Park, St. Alban's, including drainage, curbing, channelling, &c. Messrs. J. & S. Flint Clarkson, surveyors:—

		Extra for Gravelling.
Bottom, Park-street	£1,682	4s. per yard.
Coker, Luton	1,650	—
J. & W. Savage, St. Alban's	1,100	4s. per yard.
Mardell, St. Alban's	1,063	3s. 10d. ,,
Capper, St. Alban's (acceptd)	855	3s. 9d. ,,

For pair of houses at Wanstead, for Mr. Bradley. Mr. T. Bressey, architect:—

Harper	£1,249 0 0
Arber	1,149 0 0
Mundy	1,149 0 0
Willmott	910 0 0
Bragger	849 0 0

For new shop-front and back additions, for Messrs. Airey & Pearson, at 20, Rye-lane, Peckham. Mr. John Farrer, architect. No quantities supplied:—

Rosenberg	£235 0 0
Daws	154 0 0
Smith	125 0 0

For house at Maybury, Woking, Surrey, for Mr. E. Prior. Mr. E. P. Loftus Brock, architect:—

Williams	£2,500 0 0
Shearburn	2,458 0 0
Mattock, Bros	2,193 0 0
Shears	2,180 0 0
Morris	2,100 0 0
Haynes	1,999 0 0
Whitburn	1,980 10 0
Brass	1,947 0 0

For the erection of new market-house for the corporation of Over Darwen. Contract No. 3: Superstructure. Mr. Charles Bell, architect. Quantities by Mr. Henry Lovegrove:—

Booth, London	£14,906 0 0
Hughes & Stirling, Bootle	13,390 0 0
Clegg, Accrington	13,250 0 0
Abbott, Blackburn	13,148 0 0
Holt & Co., Blackburn	13,085 0 0
Bridge, Burscough	12,896 0 0
Herd, Manchester	12,587 0 0
Holdsworth, Bradford	12,400 0 0
Armitage & Hodgson, Leeds	11,900 0 0
Lloyd & Milward, Darwen	11,579 0 0
Riley, Fleetwood	11,407 0 0
Orrell & Sons, Darwen (accepted)	11,395 0 0
Whittaker, Blackburn	10,950 0 0

For the erection of new market-house for the corporation of Over Darwen. Contract No. 4: Ironwork. Mr. Charles Bell, architect:—

Allsup, Preston	£3,244 0 0
Stevens, Bros., London	3,117 0 0
Woolstenhulmes, Rye, & Co., Oldham	3,006 0 0
Clayton, Preston	2,875 0 0
Handyside & Co., Derby	2,649 0 0
Gilmour, Glasgow	2,568 0 0
Patent Shaft and Axle Co., Wednesbury	2,545 0 0
Tildesley, Wolverhampton	2,393 0 0
Drew & Co., London	2,385 0 0
Thornton, Bradford	2,379 0 0
The Tank and Boiler Co., Wolverhampton	2,323 0 0
Jukes, Coulson, Stokes, & Co., London	2,195 0 0
Woodall, Dudley	2,136 0 0
Hill & Smith, Dudley	2,043 0 0
Goddard & Massey, Nottingham*	2,022 0 0

* Accepted.

For new bakehouse, flour-store, and other works, Well-street, Bedford, for Mr. G. Hopper. Mr. F. T. Mercer, architect:—

Moore	£235 0 0
Laughton	230 12 6
Lilley	207 0 0
Corby & Son	205 0 0
Potter	198 0 0
Harrison (accepted)	184 0 0

For the erection of the new Leadenhall Market, for the Corporation of the City of London. Mr. Horace Jones, architect. Quantities by Messrs. William Reddall & Son and R. L. Curtis & Sons:—

Martin, Wells, & Co.	£58,256	0	0
Crocket	57,200	0	0
Garlick	56,600	0	0
Shurmur	55,980	0	0
Webster	55,000	0	0
Shaw	53,500	0	0
Conder	52,214	0	0
Garrud	52,033	0	0
Bull & Sons	51,637	0	0
Mowlem & Co.	50,950	0	0
Drake	50,650	0	0
Bange & Co.	49,995	0	0
Trollope & Son	49,877	0	0
Perry & Co	49,776	0	0
Holland & Hannen	49,734	0	0
Morter	49,493	0	0
Vernon & Ewens	48,240	0	0
Devlin	48,148	0	0
Nightingale (accepted)	47,518	0	0

For sundry works at offices, City of London Union, Bartholomew-close:—

Ayres	£690	0	0
Larke & Son	663	0	0
Healing	645	0	0
Staines & Son	644	0	0
Shorey	610	0	0
Thomas	610	0	0
Howard	587	0	0
Weekes & Son	579	0	0
Merritt & Ashby	575	0	0
Jones	567	15	0
Pitman & Son	555	0	0
Phillips & Son	553	0	0
Conder	551	0	0
Shurmur	549	0	0
Sawyer	540	0	0
Coombe	529	0	0
Johnson & Co.	525	17	6
Ball & Wickes	522	15	8
Marsland	518	0	0
Patten	500	0	0
Lamb	490	0	0
Benson	488	0	0
Barber	483	0	0
Derby	474	0	0
Taylor & Son	463	0	0
Robb	450	0	0
Wadsworth	450	0	0
Bulford	418	8	3½
F. G. & R. Vigor	415	0	0
Prescott	410	0	0
Spencer & Co.	409	0	0
Grimshaw	383	0	0
Fernley	375	0	0
Lewis	374	11	6
Cocks	357	0	0
Powell & Co.	350	10	0
Pitman & M'Carthy	293	0	0

For new school-buildings for the parish of St. Clement Danes (exclusive of fittings). Mr. C. W. Reeves, architect:—

Wagstaff & Son	£3,157	0	0
Wall	3,150	0	0
Hobson	3,037	0	0
Macey & Son	2,948	0	0
Howard & Darrell	2,947	0	0
Scrivener & Co. (accepted)	2,919	0	0

For the restoration of St. Nicolas Church, Abingdon. Mr. Edwin Dolby, architect:—

Groves	£2,566	0	0
Kingerlee	2,284	13	6
Allen	2,235	0	0
Selby	2,163	0	0
Claridge	2,145	0	0
Jones	1,898	0	0
Wheeler	1,857	2	6
Williams (accepted)	1,856	0	0
King	1,792	0	0
Holland	1,734	0	0

For alterations and additions to Brighton New Club King's-road, Brighton, Sussex. Mr. Thomas Lainson architect. Quantities by Messrs. Fowler & Hugman:—

Nurcombe	£6,014	16	6
Kirk & Randall	5,865	0	0
Jones	5,660	0	0
Barnes	5,640	0	0
Lockyer	5,630	0	0
Cheeseman & Co.	5,560	0	0

For new Board Schools, Tottenham. Messrs. Ellis & Son, architects. Quantities supplied:—

Field	£10,957	0	0
Child	10,940	0	0
Pocock	9,998	0	0
Cass & Co.	9,890	0	0
Humphreys	9,847	0	0
Sawyer	9,822	0	0
Knapp	9,715	0	0
Doveley	9,688	0	0
Colls & Sons	9,372	0	0
Hunt	9,323	0	0
Bell	9,285	0	0
Staines & Son	9,284	0	0
Linsell	9,000	0	0
Mattock	8,993	0	0
Julian & Co.	8,990	0	0
Brown	8,950	0	0
Ashby, Bros.	8,814	0	0
Nichols & Co.	8,749	0	0
Linfield	8,644	0	0
Wall	8,500	0	0
Taylor & Co.	8,258	0	0
Ireson	7,995	0	0
Garrard	7,983	0	0
Beale	7,451	0	0

For the erection of a drill-hall and other works, on the site of the late East London Theatre, Whitechapel-road, for Mr. Morris Abrahams. Mr. John Hudson, architect:—

Read & Son	£3,214	0	0
Little	2,791	0	0
Bangs & Co.	2,583	0	0
Hearle & Son	2,530	0	0
Morter	2,453	0	0
Bentley	2,182	0	0

For the erection of offices, &c., at 35 and 36, Lime-street, London, for Mr. G. H. Powell, Mr. Edward Sharman, architect. Quantities supplied:—

Carter & Son, Lime-street	£5,600	0	0
Underwood, Wellingborough	4,885	0	0
Williams & Son, Islington	4,446	0	0
Greenwood, Tooley-street	4,300	0	0
Roberts, Islington (accepted)	4,189	0	0

TO CORRESPONDENTS.

Disputes between Architect and Builder.—If the case be precisely as stated, responsibility would not attach to the builder. A builder who carries out instructions given by specification and drawings, under the eye of the architect, and who, moreover, expressed his dissent from the course ordered, would certainly not be held liable for the consequences of that course. As to the second question, we may discuss it on some future occasion.

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